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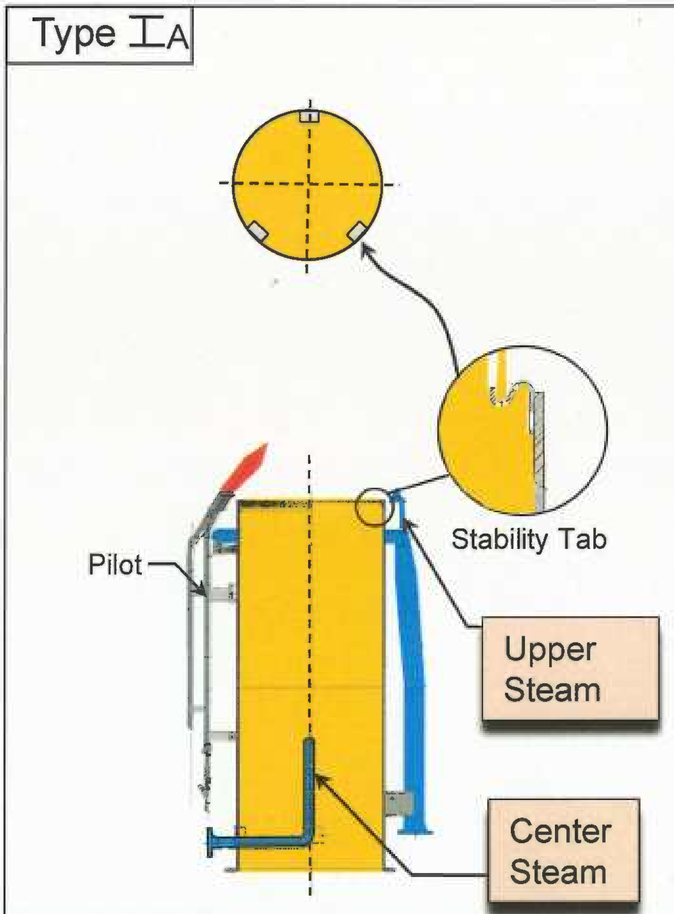
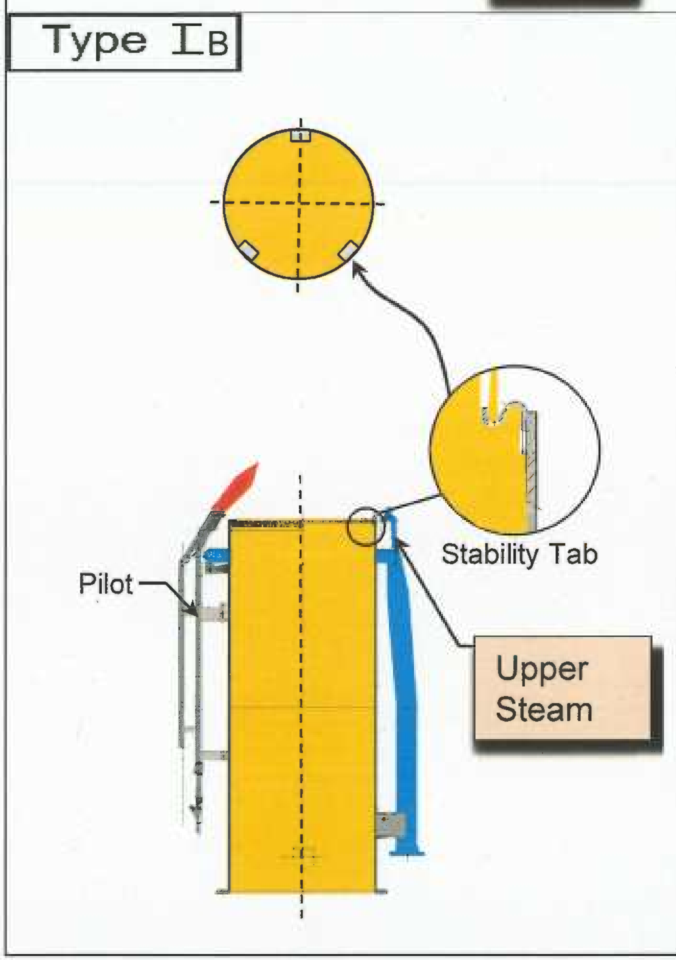
APPENDICES TO CONSENT DECREE

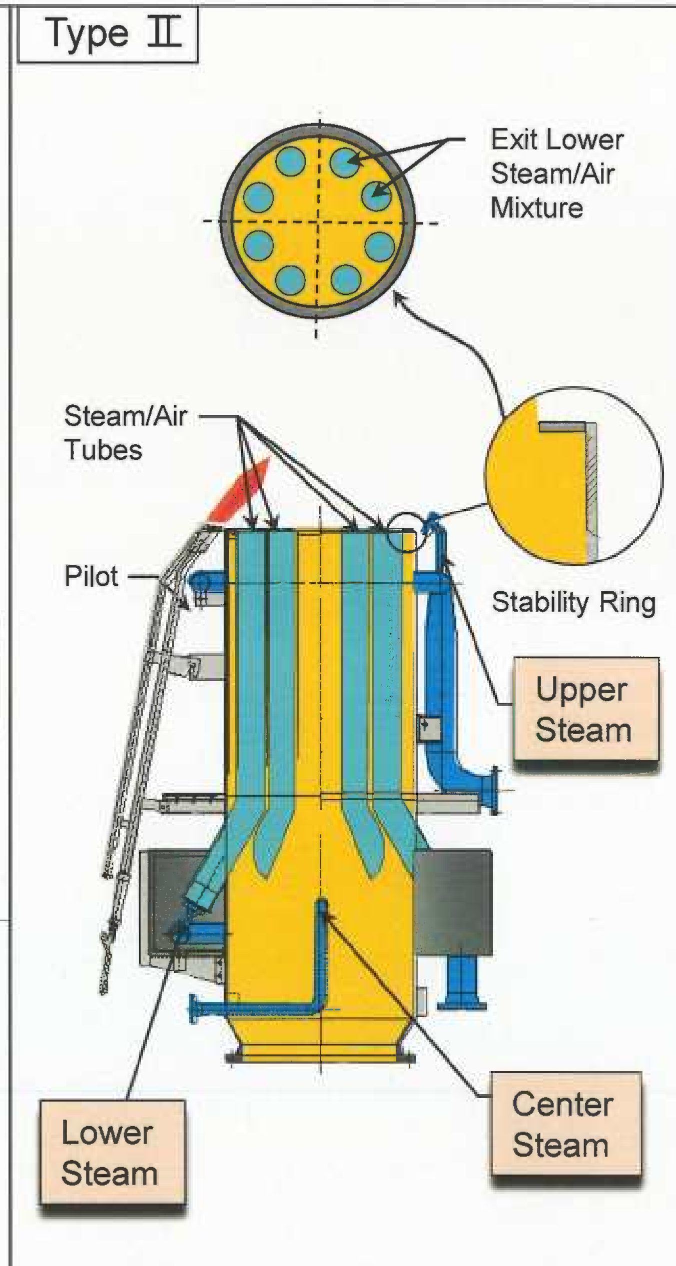
APPENDIX 1.1

DRAWINGS ILLUSTRATING LOWER, CENTER, AND UPPER STEAM INJECTION IN VARIOUS TYPES OF FLARE TIPS

Appendix 1.1





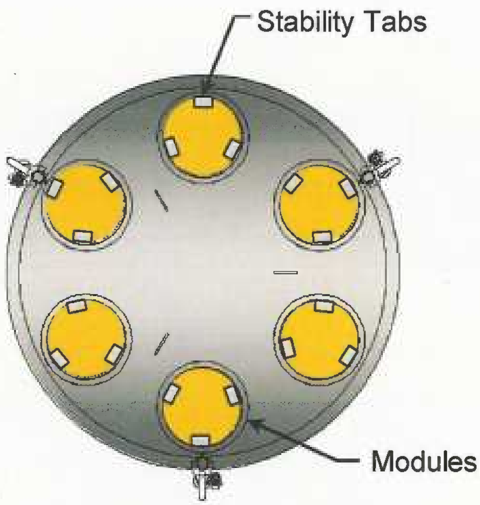


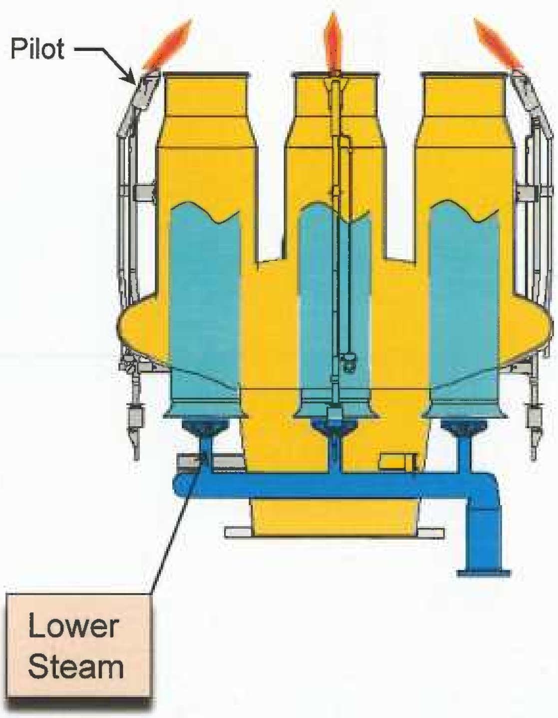
Key:

Yellow	=	Vent Gas
Red	=	Fire
Light Blue	=	Steam / Air
Dark Blue	=	Steam

Appendix 1.1

Type III





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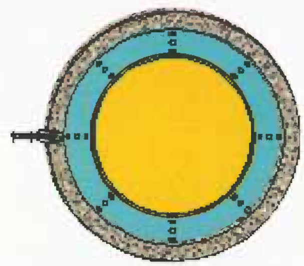

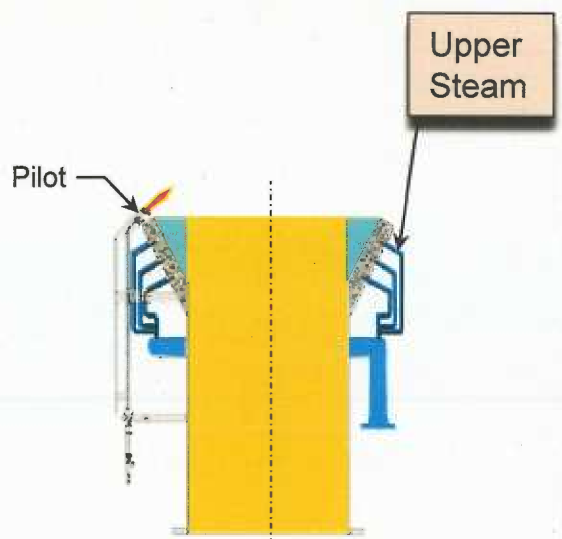

Key:

Yellow = Vent Gas
Red = Fire
Light Blue = Steam / Air
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APPENDIX 1.2

GENERAL EQUATIONS

APPENDIX 1.2

GENERAL EQUATIONS

Equation 1: **"*Combustion Efficiency*" or "*CE*":**

$CE = [CO_2]/([CO_2] + [CO] + [OC])$

where:

$[CO_2]$ = Concentration in volume percent or ppm-meters of carbon dioxide in the combusted gas immediately above the Combustion Zone

$[CO]$ = Concentration in volume percent or ppm-meters of carbon monoxide in the combusted gas immediately above the Combustion Zone

$[OC]$ = Concentration in volume percent or ppm-meters of the sum of all organic carbon compounds in the combusted gas immediately above the Combustion Zone, counting each carbon molecule separately where the concentration of each individual compound is multiplied by the number of carbon atoms it contains before summing (*e.g.*, 0.1 volume percent ethane shall count as 0.2 percent OC because ethane has two carbon atoms)

For purposes of using the *CE* equation, the unit of measurement for CO_2, CO, and OC must be the same; that is, if "volume percent" is used for one compound, it must be used for all compounds. "Volume percent" cannot be used for one or more compounds and "ppm-meters" for the remainder.

Equation 2: ***"Center Steam Mass Flow Rate" or "$\dot{m}_{s\text{-}cen}$":***

$\dot{m}_{s\text{-}cen} = Q_{s\text{-}cen} \times (18/385.5)$

where:

$Q_{s\text{-}cen}$ = Center Steam Volumetric Flow Rate

Equation 3: ***"Total Steam Mass Flow Rate" or "$\dot{m}_s$":***

$\dot{m}_s = Q_s \times (18/385.5)$

where:

Q_s = Total Steam Volumetric Flow Rate

APPENDIX 1.2

Equation 4: ***"Vent Gas Mass Flow Rate"*** **or "$\dot{m}_{vg}$":**

$$\dot{m}_{vg} = Q_{vg} \text{ x } (MW_{vg}/385.5)$$

where:

Q_{vg} = Vent Gas Volumetric Flow Rate

MW_{vg} = Molecular Weight, in pounds per pound-mole, of the Vent Gas, as measured by the Vent Gas Average Molecular Weight Analyzer described in Paragraph 17 of this Consent Decree

[End of Appendix 1.2]

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APPENDICES TO CONSENT DECREE

APPENDIX 1.4

EPA'S POLICY ON EXCESS EMISSIONS DURING MALFUNCTIONS, STARTUP, AND SHUTDOWN

APPENDIX 1.4

POLICY ON EXCESS EMISSIONS DURING MALFUNCTIONS, STARTUP, AND SHUTDOWN

Introduction

This policy specifies when and in what manner state implementation plans (SIPs) may provide for defenses to violations caused by periods of excess emissions due to malfunctions,[1] startup, or shutdown. Generally, since SIPs must provide for attainment and maintenance of the national ambient air quality standards and the achievement of PSD increments, all periods of excess emissions must be considered violations. Accordingly, any provision that allows for an automatic exemption[2] for excess emissions is prohibited.

However, the imposition of a penalty for excess emissions during malfunctions caused by circumstances entirely beyond the control of the owner or operator may not be appropriate. States may, therefore, as an exercise of their inherent enforcement discretion, choose not to penalize a source that has produced excess emissions under such circumstances.

This policy provides an alternative approach to enforcement discretion for areas and pollutants where the respective contributions of individual sources to pollutant concentrations in ambient air are such that no single source or small group of sources has the potential to cause an exceedance of the NAAQS or PSD increments. Where a single source or small group of sources has the potential to cause an exceedance of the NAAQS or PSD increments, as is often the case for sulfur dioxide and lead,[3] EPA believes approaches other than enforcement discretion are not appropriate. In such cases, any excess emissions may have a significant chance of causing an exceedance or violation of the applicable standard or PSD increment.

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[1]The term <u>excess emission</u> means an air emission level which exceeds any applicable emission limitation. <u>Malfunction</u> means a sudden and unavoidable breakdown of process or control equipment.

[2]The term <u>automatic exemption</u> means a generally applicable provision in a SIP that would provide that if certain conditions existed during a period of excess emissions, then those exceedances would not be considered violations.

[3]This policy also does not apply for purposes of PM2.5 NAAQS. In American Trucking Association v. EPA, 175 F. 3d 1027 (D.C. Circ., 1999), the court remanded the PM2.5 NAAQS to the EPA. The Agency has not determined whether this policy is appropriate for PM2.5 NAAQS.

APPENDIX 1.4

Except where a single source or small group of sources has the potential to cause an exceedance of the NAAQS or PSD increments, states may include in their SIPs affirmative defenses[4] for excess emissions, as long as the SIP establishes limitations consistent with those set out below. If approved into a SIP, an affirmative defense would be available to sources in an enforcement action seeking penalties brought by the state, EPA, or citizens. However, a determination by the state not to take an enforcement action would not bar EPA or citizen action.[5]

In addition, in certain limited circumstances, it may be appropriate for the State to build into a source-specific or source-category-specific emission standard a provision stating that the otherwise applicable emission limitations do not apply during narrowly defined startup and shutdown periods.

I. AUTOMATIC EXEMPTIONS AND ENFORCEMENT DISCRETION

If a SIP contains a provision addressing excess emissions, it cannot be the type that provides for automatic exemptions. Automatic exemptions might aggravate ambient air quality by excusing excess emissions that cause or contribute to a violation of an ambient air quality standard. Additional grounds for disapproving a SIP that includes the automatic exemption approach are discussed in more detail at 42 Fed. Reg. 58171 (November 8, 1977) and 42 Fed. Reg. 21372 (April 27, 1977). As a result, EPA will not approve any SIP revisions that provide automatic exemptions for periods of excess emissions.

The best assurance that excess emissions will not interfere with NAAQS attainment, maintenance, or increments is to address excess emissions through enforcement discretion. This policy provides alternative means for addressing excess emissions of criteria pollutants. However, this policy does not apply where a single source or small group of sources has the potential to cause an exceedance of the NAAQS or PSD increments. Moreover,

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[4]The term affirmative defense means, in the context of an enforcement proceeding, a response or defense put forward by a defendant, regarding which the defendant has the burden of proof, and the merits of which are independently and objectively evaluated in a judicial or administrative proceeding.

[5]Because all periods of excess emissions are violations and because affirmative defense provisions may not apply in actions for injunctive relief, under no circumstances would EPA consider periods of excess emissions, even if covered by an affirmative defense, to be "federally permitted releases" under EPCRA or CERCLA.

nothing in this guidance should be construed as requiring States to include affirmative defense provisions in their SIPs.

II. AFFIRMATIVE DEFENSES FOR MALFUNCTIONS

The EPA can approve a SIP revision that creates an affirmative defense to claims for penalties in enforcement actions regarding excess emissions caused by malfunctions as long as the defense does not apply to SIP provisions that derive from federally promulgated performance standards or emission limits, such as new source performance standards (NSPS) and national emissions standards for hazardous air pollutants (NESHAPS).[6] In addition, affirmative defenses are not appropriate for areas and pollutants where a single source or small group of sources has the potential to cause an exceedance of the NAAQS or PSD increments. Furthermore, affirmative defenses to claims for injunctive relief are not allowed. To be approved, an affirmative defense provision must provide that the defendant has the burden of proof of demonstrating that:

1. The excess emissions were caused by a sudden, unavoidable breakdown of technology, beyond the control of the owner or operator;

2. The excess emissions (a) did not stem from any activity or event that could have been foreseen and avoided, or planned for, and (b) could not have been avoided by better operation and maintenance practices;

3. To the maximum extent practicable the air pollution control equipment or processes were maintained and operated in a manner consistent with good practice for minimizing emissions;

4. Repairs were made in an expeditious fashion when the operator knew or should have known that applicable emission limitations were being exceeded. Off-shift labor and overtime must have been utilized, to the extent practicable, to ensure that such repairs were made as expeditiously as practicable;

5. The amount and duration of the excess emissions (including any bypass) were minimized to the maximum extent practicable during periods of such emissions;

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[6]To the extent a State includes NSPS or NESHAPS in its SIP, the standards should not deviate from those that were federally promulgated. Because EPA set these standards taking into account technological limitations, additional exemptions would be inappropriate.

APPENDIX 1.4

6. All possible steps were taken to minimize the impact of the excess emissions on ambient air quality;

7. All emission monitoring systems were kept in operation if at all possible;

8. The owner or operator's actions in response to the excess emissions were documented by properly signed, contemporaneous operating logs, or other relevant evidence;

9. The excess emissions were not part of a recurring pattern indicative of inadequate design, operation, or maintenance; and

10. The owner or operator properly and promptly notified the appropriate regulatory authority.

The EPA interprets these criteria narrowly. Only those malfunctions that are sudden, unavoidable, and unpredictable in nature qualify for the defense. For example, a single instance of a burst pipe that meets the above criteria may qualify under an affirmative defense. The defense would not be available, however, if the facility had a history of similar failures because of improper design, improper maintenance, or poor operating practices. Furthermore, a source must have taken all available measures to compensate for and resolve the malfunction. If a facility has a baghouse fire that leads to excess emissions, the affirmative defense would be appropriate only for the period of time necessary to modify or curtail operations to come into compliance. The fire should not be used to excuse excess emissions generated during an extended period of time while the operator orders and installs new bags, and relevant SIP language must limit applicability of the affirmative defense accordingly.

III. EXCESS EMISSIONS DURING STARTUP AND SHUTDOWN

In general, startup and shutdown of process equipment are part of the normal operation of a source and should be accounted for in the planning, design, and implementation of operating procedures for the process and control equipment. Accordingly, it is reasonable to expect that careful and prudent planning and design will eliminate violations of emission limitations during such periods.

A. SOURCE CATEGORY SPECIFIC RULES FOR STARTUP AND SHUTDOWN

For some source categories, given the types of control technologies available, there may exist short periods of emissions during startup and shutdown when, despite best efforts regarding planning, design, and operating procedures, the

otherwise applicable emission limitation cannot be met. Accordingly, except in the case where a single source or small group of sources has the potential to cause an exceedance of the NAAQS or PSD increments, it may be appropriate, in consultation with EPA, to create narrowly-tailored SIP revisions that take these technological limitations into account and state that the otherwise applicable emissions limitations do not apply during narrowly defined startup and shutdown periods. To be approved, these revisions should meet the following requirements:

1. The revision must be limited to specific, narrowly-defined source categories using specific control strategies (e.g., cogeneration facilities burning natural gas and using selective catalytic reduction);

2. Use of the control strategy for this source category must be technically infeasible during startup or shutdown periods;

3. The frequency and duration of operation in startup or shutdown mode must be minimized to the maximum extent practicable;

4. As part of its justification of the SIP revision, the state should analyze the potential worst-case emissions that could occur during startup and shutdown;

5. All possible steps must be taken to minimize the impact of emissions during startup and shutdown on ambient air quality;

6. At all times, the facility must be operated in a manner consistent with good practice for minimizing emissions, and the source must have used best efforts regarding planning, design, and operating procedures to meet the otherwise applicable emission limitation; and

7. The owner or operator's actions during startup and shutdown periods must be documented by properly signed, contemporaneous operating logs, or other relevant evidence.

B. GENERAL AFFIRMATIVE DEFENSE PROVISIONS RELATING TO STARTUP AND SHUTDOWN

In addition to the approach outlined in Section II(A) above, States may address the problem of excess emissions occurring during startup and shutdown periods through an enforcement discretion approach. Further, except in the case where a single source or small group of sources has the potential to cause an exceedance of the NAAQS or PSD increments, States may also adopt for their SIPs an affirmative defense approach. Using this

approach, all periods of excess emissions arising during startup and shutdown must be treated as violations, and the affirmative defense provision must not be available for claims for injunctive relief. Furthermore, to be approved, such a provision must provide that the defendant has the burden of proof of demonstrating that:

1. The periods of excess emissions that occurred during startup and shutdown were short and infrequent and could not have been prevented through careful planning and design;

2. The excess emissions were not part of a recurring pattern indicative of inadequate design, operation, or maintenance;

3. If the excess emissions were caused by a bypass (an intentional diversion of control equipment), then the bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

4. At all times, the facility was operated in a manner consistent with good practice for minimizing emissions;

5. The frequency and duration of operation in startup or shutdown mode was minimized to the maximum extent practicable;

6. All possible steps were taken to minimize the impact of the excess emissions on ambient air quality;

7. All emission monitoring systems were kept in operation if at all possible;

8. The owner or operator's actions during the period of excess emissions were documented by properly signed, contemporaneous operating logs, or other relevant evidence; and

9. The owner or operator properly and promptly notified the appropriate regulatory authority.

If excess emissions occur during routine startup or shutdown periods due to a malfunction, then those instances should be treated as other malfunctions that are subject to the malfunction provisions of this policy. (Reference Part I above).

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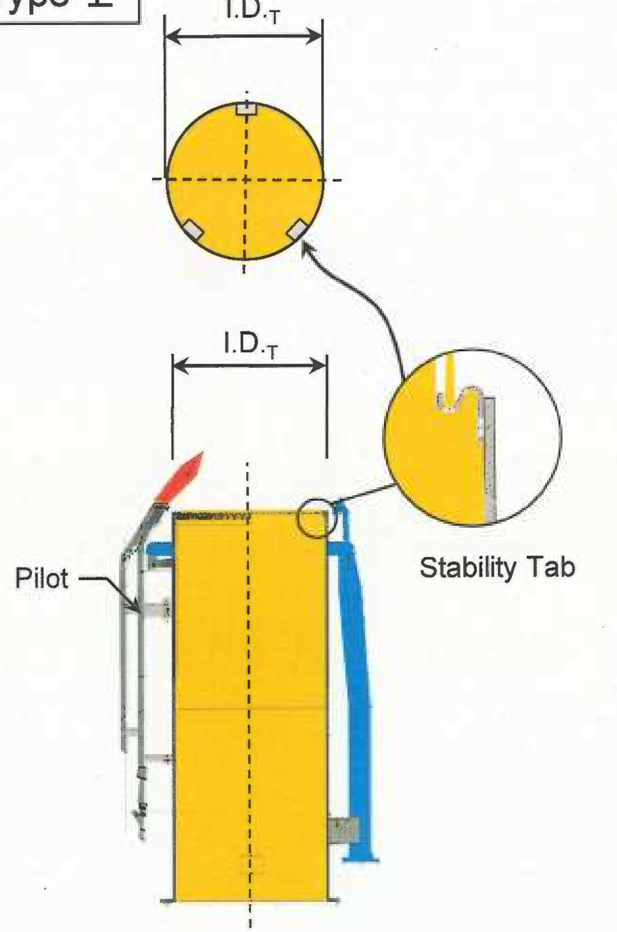
APPENDIX 1.6

CALCULATING THE UNOBSTRUCTED CROSS SECTIONAL AREA OF VARIOUS TYPES OF FLARE TIPS

APPENDIX 1.6

Type I



$A_{tip\text{-}unob} = \pi(I.D._{T})^2/4 - (X_T * A_{ST})$

Where: $A_{tip\text{-}unob}$ = Unobstructed Cross Sectional Area of Flare Tip

$I.D._{T}$ = Inside Diameter Flare Tip

X_T = Number of Stability Tabs

A_{ST} = Area of a Stability Tab

Example: $I.D._{T}$ = 41.5 inches

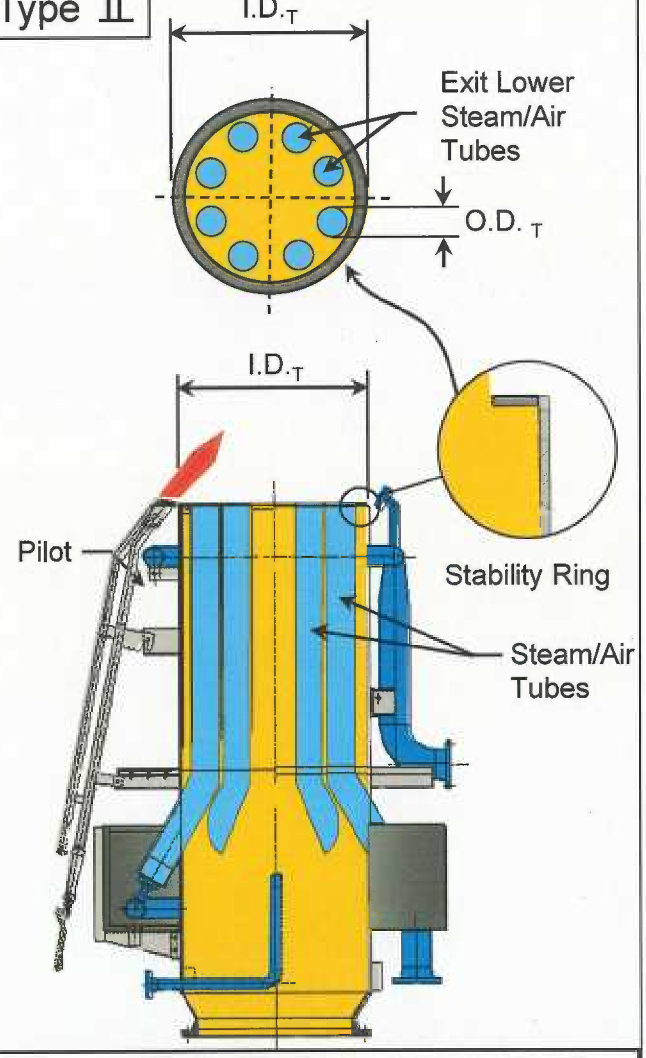
$X_T = 3$

A_{ST} = 3 Sq. inches

$A_{tip\text{-}unob} = \pi(41.5)^2/4 - (3 * 3)$

$A_{tip\text{-}unob}$ = 1344 Sq. inches

Type II



$A_{tip\text{-}unob} = \pi(I.D._{T})^2/4 - A_{ST} - N_T * \pi * (O.D._{T})^2/4$

Where: $A_{tip\text{-}unob}$ = Unobstructed Cross Sectional Area of Flare Tip

$I.D._{T}$ = Inside Diameter Flare Tip

A_{ST} = Area of Stability Ring

$O.D._{T}$ = Outside Diameter of Steam/Air Tubes

N_T = Number of Steam/Air Tubes

Example: $I.D._{T}$ = 47.5 inches

A_{ST} = 100 Sq. inches

$O.D._{T}$ = 6.5 inches

$N_T = 8$

$A_{tip\text{-}unob} = \pi\ (47.5)^2/4 - 100 - 8 * \pi * (6.5)^2/4$

$A_{tip\text{-}unob}$ = 1322 Sq. inches

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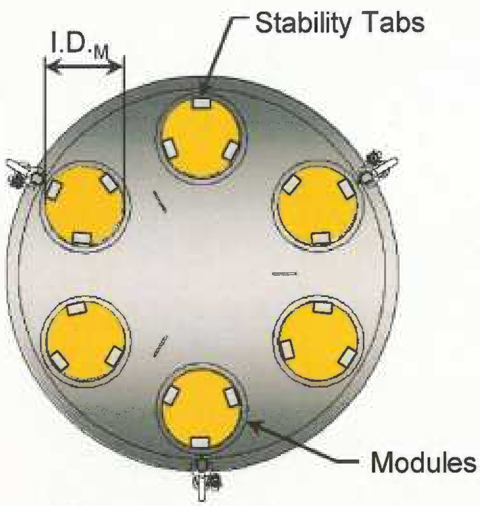
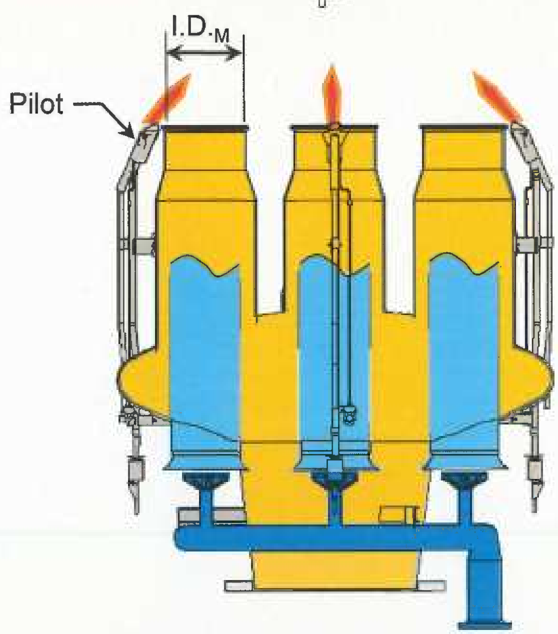
Type III





$$A_{tip\text{-}unob} = N_M * (\pi * (I.D._M)^2/4 - X_T * A_{ST})$$

Where: $A_{tip\text{-}unob}$ = Unobstructed Cross Sectional Area of Flare Tip

$I.D._M$ = Inside Diameter of One Tip Module

N_M = Number of Modules

X_T = Number of Stability Tabs per Module

A_{ST} = Area of a Stability Tab

Example: $I.D._M$ = 17 inches

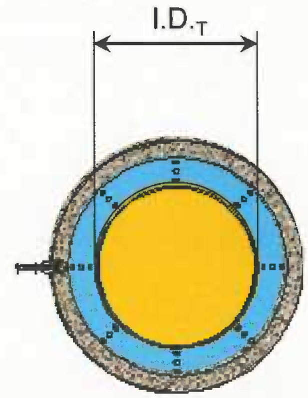
$N_M = 6$ $X_T = 3$

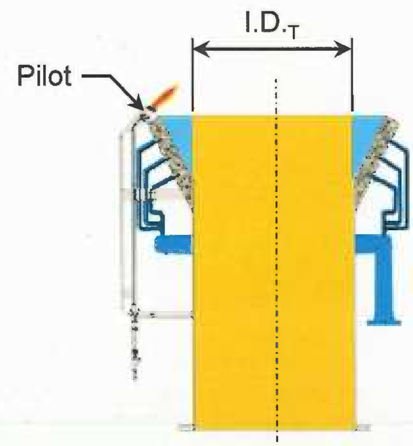
A_{ST} = 3 Sq. inches

$$A_{tip\text{-}unob} = 6 * (\pi * (17)^2/4 - 3 * 3)$$

$A_{tip\text{-}unob}$ = 1308 Sq. inches

Type IV





$$A_{tip\text{-}unob} = \pi (I.D._T)^2/4$$

Where: $A_{tip\text{-}unob}$ = Unobstructed Cross Sectional Area of Flare Tip

$I.D._T$ = Inside Diameter of Flare Tip

Example: $I.D._T$ = 41.5 inches

$$A_{tip\text{-}unob} = \pi (41.5)^2/4$$

$A_{tip\text{-}unob}$ = 1353 Sq. inches

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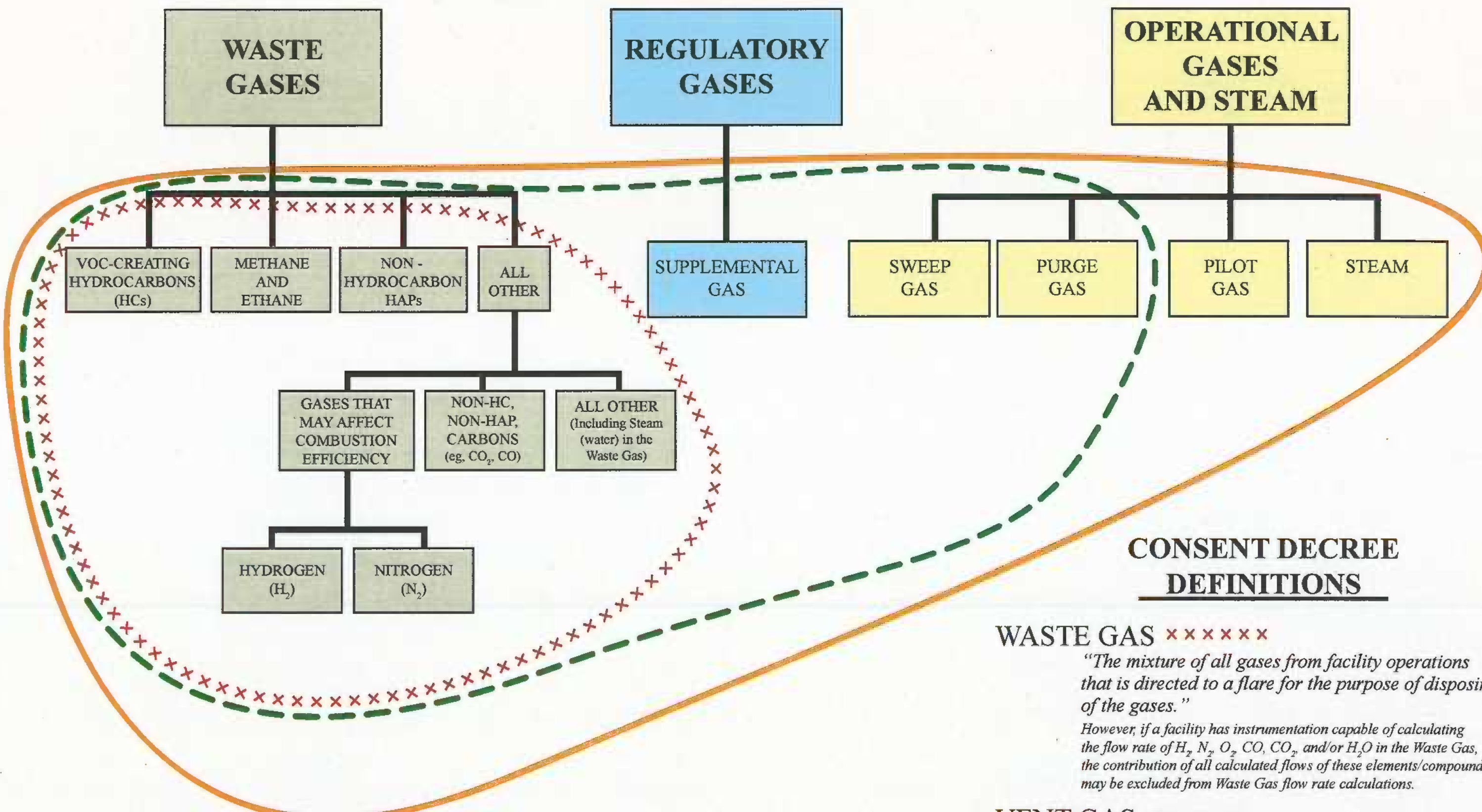
APPENDIX 1.7

DEPICTION OF GASES ASSOCIATED WITH STEAM-ASSISTED FLARES

DEPICTION OF GASES ASSOCIATED WITH STEAM-ASSISTED FLARES



CONSENT DECREE DEFINITIONS

WASTE GAS × × × × × ×

"The mixture of all gases from facility operations that is directed to a flare for the purpose of disposing of the gases."

However, if a facility has instrumentation capable of calculating the flow rate of H_2, N_2, O_2, CO, CO_2, and/or H_2O in the Waste Gas, the contribution of all calculated flows of these elements/compounds may be excluded from Waste Gas flow rate calculations.

VENT GAS – – – –

"The mixture of all gases found prior to the flare tip. This includes all Waste Gas, Supplemental Gas, Sweep Gas, and Purge Gas."

COMBUSTION ZONE GAS

"The mixture of all gases and steam found just after the flare tip. This includes all Vent Gas, Pilot Gas, and Total Steam."

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APPENDIX 1.8

OUTLINE OF REQUIREMENTS FOR THE FLARE DATA AND INITIAL MONITORING SYSTEMS REPORT

APPENDIX 1.8

OUTLINE OF REQUIREMENTS FOR THE FLARE DATA AND INITIAL MONITORING SYSTEMS REPORT

1. Facility-Wide

    1.1 Facility plot plan showing the location of each flare in relation to the general plant layout

2. General Description of Flare

    2.1 Ground or elevated
    2.2 Type of assist system
    2.3 Simple or integrated (*e.g.*, sequential, staged)
    2.4 Date first installed
    2.5 History of any physical changes to the Flare
    2.6 Whether the Flare is a Temporary-Use Flare, and if so, the duration and time periods of use
    2.7 Flare Gas Recovery System ("FGRS"), if any, and date first installed

3. Flare Components: Complete description of each major component of the Flare, except the Flare Gas Recovery System (*see* Part 5), including but not limited to:

    3.1 Flare stack (for elevated flares)
    3.2 Flare tip
        3.1.2.1 Date installed
        3.1.2.2 Manufacturer
        3.1.2.3 Tip Size
        3.1.2.4 Tip Drawing
    3.3 Knockout or surge drum(s) or pot(s), including dimensions and design capacities
    3.4 Water seal(s), including dimensions and design parameters
    3.5 Flare header(s)
    3.6 Sweep Gas system
    3.7 Purge gas system
    3.8 Pilot gas system
    3.9 Supplemental gas system
    3.10 Assist system
    3.11 Ignition system

4. Simplified process diagram(s) showing the configuration of the components listed in Paragraph 3

5. Existing Flare Gas Recovery System ("FGRS")

   5.1 Complete description of each major component, including but not limited to:
      5.1.1 Compressor(s), including design capacities
      5.1.2 Water seal(s), rupture disk, or similar device to divert the flow
   5.2 Maximum actual past flow on an scfm basis and the annual average flow in scfm for the lesser of the five years preceding Date of Lodging or since the FGRS has been in operation
   5.3 Simplified schematic showing the FGRS
   5.4 Process Flow Diagram that adds the FGRS to the PDF(s) in Part 4

6. Flare Design Parameters

   6.1 Maximum Vent Gas Flow Rate and/or Mass Rate
   6.2 Maximum Sweep Gas Flow Rate and/or Mass Rate
   6.3 Maximum Purge Gas Flow and/or Mass Rate, if applicable
   6.4 Maximum Pilot Gas Flow and/or Mass Rate
   6.5 Maximum Supplemental Gas Flow Rate and/or Mass Rate
   6.6 If steam-assisted, Minimum Total Steam Rate, including all available information on how that Rate was derived

7. Gases Venting to Flare

   7.1. Sweep Gas
      7.1.1 Type of gas used
      7.1.2 Actual set operating flow rate (in scfm)
      7.1.3 Average lower heating value expected for each type of gas used
   7.2 Purge Gas, if applicable
      7.2.1 Type of gas used
      7.2.2 Actual set operating flow rate (in scfm)
      7.2.3 Average lower heating value expected for each type of gas used
   7.3 Pilot Gas
      7.3.1 Type of gas used
      7.3.2 Actual set operating flow rate (in scfm)
      7.3.3 Average lower heating value expected for each type of gas used
   7.4 Supplemental Gas
      7.4.1 Type of gas used
      7.4.2 Average lower heating value expected for each type of gas used
   7.5 Steam (if applicable)
      7.5.1 Drawing showing points of introduction of Lower, Center, Upper, and any other steam

7.6 Simplified flow diagram that depicts the points of introduction of all gases, including Waste Gases, at the Flare (in this diagram, the detailed drawings of 7.5.1 may be simplified; in addition, detailed Waste Gas mapping is not required; a simple identification of the header(s) that carries(y) the Waste Gas to the Flare and show(s) its(their) location in relation to the location of the introduction of the other gases is all that is required)

8. Existing Monitoring Systems

8.1 A brief narrative description, including manufacturer and date of installation, of all existing monitoring systems, including but not limited to:

8.1.1 Waste Gas and/or Vent Gas flow monitoring
8.1.2 Waste Gas and/or Vent Gas heat content analyzer
81.3 Sweep Gas flow monitoring
8.1.4 Purge Gas flow monitoring
8.1.5 Supplemental Gas flow monitoring
8.1.6 Steam flow monitoring
8.1.7 Waste Gas or Vent Gas molecular weight analyzer
8.1.8 Gas Chromatograph
8.1.9 Sulfur analyzer(s) (not applicable for stand-alone olefins plants)
8.1.10 Video camera
8.1.11 Thermocouple

8.2 Drawing(s) showing locations of all existing monitoring systems

9. Monitoring Equipment to be installed to comply with Consent Decree

10. Narrative Description of the monitoring methods, calculations, and control logic that will be used to comply with the NHV_{CZ} and S/VG requirements in the Consent Decree

11. Identification of Calibration Gases to be used to comply with Appendix 1.10

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APPENDIX 1.9

LIST OF COMPOUNDS A GAS CHROMATOGRAPH MUST BE CAPABLE OF SPECIATING

APPENDIX 1.9

LIST OF COMPOUNDS A GAS CHROMATOGRAPH MUST BE CAPABLE OF SPECIATING

The LOU Gas Chromatograph must be capable of speciating the Vent Gas into the following:

1. Hydrogen
2. Oxygen
3. Nitrogen
4. Carbon Dioxide
5. Carbon Monoxide
6. Methane
7. Ethane
8. Ethene (aka: Ethylene)
9. Propane
10. Propene (aka: Propylene)
11. 2-Methylpropane (aka: iso-Butane)
12. Butane (aka: n-Butane)
13. Isomers of butene: But-1-ene (aka: butene, alpha-butylene); 2-methylpropene (aka: iso-butylene, iso-butene); E-but-2-ene (aka: beta-butylene, trans-butene); Z-but-2-ene (aka: beta-butylene, cis-butene)
14. 1,3 butadiene
15. Pentane plus (aka: C_5 plus) (*i.e.*, all HCs with five Cs or more)
16. Benzene
17. Toluene
18. Ethylbenzene
19. Xylenes

Outputs from the LOU Gas Chromatograph shall be on a mole percent basis.

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APPENDICES TO CONSENT DECREE

APPENDIX 1.10

EQUIPMENT AND INSTRUMENTATION TECHNICAL SPECIFICATIONS AND QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

APPENDIX 1.10

EQUIPMENT AND INSTRUMENTATION TECHNICAL SPECIFICATIONS AND QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

These technical specifications are the minimally acceptable standards. Standards better than or beyond these are acceptable.

I. VENT GAS FLOW METER

a. Velocity Range: 0.1–250 ft/sec

b. Repeatability: ± 1% of reading over the velocity range

c. Design Accuracy: ± 5% initially to 30%, 60%, and 90% of monitor full scale as certified by the manufacturer

d. Operational Accuracy: ± 20% of reading over the velocity range of 0.1–1 ft/s and ± 5% of reading over the velocity range of 1–250 ft/s

e. Installation: Applicable AGA, ANSI, API, or equivalent standard

f. Flow Rate Determination: Must be corrected to one atmosphere pressure and 68 °F

g. QA/QC: Annual calibration shall be conducted.

h. Pressure and Temperature Sensors: *See* Part IV below.

II. VENT GAS AVERAGE MOLECULAR WEIGHT ANALYZER (may be part of the Vent Gas Flow Meter)

a. Molecular Weight Range and Accuracy: 2 to 120 gr/grmol, ± 2%

III. STEAM FLOW METER

A. For the steam flow meters at the LOU and AU Flare that exist as of the Date of Lodging ("Current Steam Flow Meters"):

a. Pressure and Temperature: Currently-existing steam flow meters do not have pressure or temperature sensors. FHR assumes the following values:

METER	PRESSURE	TEMPERATURE
150# steam (FR 902)	159 psig	510° F
600# steam (FR 903)	590 psig	700° F

b. Flow Rate Determination: Must be corrected to one atmosphere pressure and 68 °F

c. QA/QC: Annual calibration shall be conducted.

B. For the steam flow meters that must be installed by the earlier of the next LOU and AU flare outage or December 31, 2020 ("New Steam Flow Meters"):

a. Repeatability: ± 5% of reading over the range of the instrument

b. Accuracy: +/- 1% of full scale for ranges between 15% and 100% of full scale

+/- 2% of full scale for ranges between 6% and 15% of full scale

+/- 3% of full scale for ranges between 4% and 6% of full scale

c. Installation: Applicable AGA, ANSI, API, or equivalent standard

d. Flow Rate Determination: Must be corrected to one atmosphere pressure and 68 °F

e. QA/QC: Annual calibration shall be conducted.

IV. VENT GAS FLOW METERS: PRESSURE AND TEMPERATURE SENSORS

a. Temperature monitor must be calibrated annually to ± 5%.

b. Pressure monitor must be calibrated annually to within ± 5%.

V. GAS CHROMATOGRAPH ("GC")

A. General

a. Accuracy: ± 5% over full scale.

b. 8-Hour Repeatability:

± 0.5% of full scale for ranges between 2-100% of full scale;

± 1% of full scale for ranges between 0.05-2% of full scale;
± 2% of full scale for ranges between 50-500 ppm;
± 3% of full scale for ranges between 5-50 ppm;
± 5% of full scale for ranges between 0.5-5 ppm.

c. The minimum sampling frequency shall be one sample every 20 minutes.

d. The GC shall be capable of speciating all gas constituents listed in Appendix 1.9.

e. The sampling system sample line shall be heat traced and maintained at no lower than 150 degrees Fahrenheit with no cold spots. The sampling cabinet shall be maintained at no lower than 110 degrees Fahrenheit. All system components shall be heated, including the probe external to the flare piping, calibration valve, sample lines, sampling loop (or sample introduction system), and GC oven.

f. Where technically feasible, the sampling location should be at least two equivalent duct diameters downstream from the nearest control device, point of pollutant generation, or other point at which a change in the pollutant concentration or emission rate occurs. The location should not be close to air in-leakages. Where technically feasible, the location should also be at least 0.5 diameters upstream from the exhaust or control device.

B. **Calibration Standards: Net Heating Value and Analyte Measurements**. For the Net Heating Value and Analyte measurements, the GC shall be operated and maintained in accordance with Performance Specification 9 ("PS9") of Appendix B of 40 C.F.R. Part 60 except:

1. The daily mid-level validation procedure in Section 10.2 of PS9 shall be conducted on the calculated Net Heating Value of the certified calibration gas based upon the concentration of each analyte. The average instrument response shall not vary by more than 10 percent from the Net Heating Value of the certified calibration gas.

2. The multi-point calibration error check procedure in Section 10.1 of PS9 shall be conducted quarterly for the limited set of analytes listed in Subparagraph V.B.3 below. No calibrations will be required after routine maintenance or repair where such activities do not have the potential to alter the sampling or analysis of the gas. The GC must meet the calibration performance criteria in Sections 13.1 and 13.2 of PS9 for the listed analytes only.

3. The analytes to be used are:

i. Hydrogen
ii. Nitrogen

iii. Methane
iv. Ethane
v. Propane
vi. Propylene
vii. Ethylene

4. The calibration gas mixtures may be set by the procedures identified in Section 7.1 of PS9 or may be within 10 percent of the concentration values listed in Table 1. The gases must be certified to ± 2 percent.

Table 1: Calibration Gas Mixtures for Net Heating Value Calibrations/Validations[1]

Component	Daily Mid-Level	Quarterly Low-Level	Quarterly Mid-Level	Quarterly High-Level
Hydrogen	30	8	30	12
Nitrogen	8	65	8	5
Methane	48	22	48	30
Ethane	3	2	3	30
Propane	2	1	2	15
Propylene	8	1	8	5
Ethylene	1	1	1	3
NHV (Btu/scf) Unadjusted for H2	793	310	793	1273

[1] The individual analytes are in volume percent.

VI. NET HEATING VALUE ANALYZER ("NHV Analyzer")

A. General

1. Accuracy: ± 5% of full scale.

2. Repeatability: ± 1% of reading over full scale.

3. The minimum sampling frequency shall be one sample every 5 minutes.

4. Where technically feasible, the sampling location should be at least two equivalent duct diameters downstream from the nearest control device, point of pollutant generation, or other point at which a change in the pollutant concentration or emission rate occurs. The location should not be close to air in-leakages. Where technically feasible, the location should also be at least 0.5 diameters upstream from the exhaust or control device.

B. Calibration Standards: Net Heating Value and Analyte Measurements. The Net Heating Value Analyzer shall be operated and maintained in accordance with the following:

1. Daily Validation Procedure. A daily low-level and mid-level validation procedure shall be conducted on the calculated Net Heating Value of a certified calibration gas mixture that is developed pursuant to Subparagraph VI.B.3. below. The average instrument response shall not vary by more than 10 percent from the Net Heating Value of the certified calibration gas.

2. Quarterly Validation Procedure. A multi-point (*i.e.*, low-level, mid-level, high-level) calibration error check procedure as set forth in Section 10.1 of PS9 shall be conducted quarterly using the calibration gas mixture developed pursuant to Subparagraph VI.B.3. below. No calibrations will be required after routine maintenance or repair where such activities do not have the potential to alter the sampling or analysis of the gas. The Net Heating Value Analyzer must meet the calibration performance criteria in Sections 13.1 and 13.2 of PS9 such that the precision check of the NHV measured by the NHV Analyzer does not deviate by more than 5 percent from the NHV of the calibration gas.

3. The calibration gas mixtures may be set by the procedures identified in Section 7.1 of PS9 or may be within 10 percent of the concentration values listed in Table 2. The gases must be certified to ± 2 percent.

Table 2: Calibration Gas Mixtures for Net Heating Value Calibrations/Validations[1]

Component	Daily Low-Level	Daily Mid-Level	Quarterly Low-Level	Quarterly Mid-Level	Quarterly High-Level
Hydrogen	8	30	8	30	12
Nitrogen	65	8	65	8	5
Methane	22	48	22	48	30
Ethane	2	3	2	3	30
Propane	1	2	1	2	15
Propylene	1	8	1	8	5
Ethylene	1	1	1	1	3
NHV (Btu/scf) Unadjusted for H2	310	793	310	793	1273

[1] The individual analytes are in volume percent.

VII. Calculation of Instrument Downtime

A. Gas Chromatograph

1. For purposes of calculating the 110 hours per calendar quarter of instrument downtime allowed pursuant to Paragraphs 18 and 38 of the Consent Decree, the time used for GC calibration and validation activities required by Subparagraph V.B. of this Appendix may be excluded.

2. Any hour that meets the requirements as set forth below shall not be counted toward instrument downtime. Specifically:

   (i) For a full operating hour (any clock hour where the flare is available for operation for 60 minutes), if there are at least three valid data points to calculate the hourly average (that is, one data point in each of the 20-minute sector of the hour), then there is no period of instrument downtime;

   (ii) For a partial operating hour (any clock hour where the flare is available for operation for less than 60 minutes), if there is at least one valid data point in each 20-minute sector of the hour in which the flare is available for operation to calculate the hourly average, then there is no period of instrument downtime; and

   (iii) For any operating hour in which required maintenance or quality-assurance activities on the instruments or monitoring systems associated with the flare are performed:

      (A) If the flare is available for operation in two or more 15-minute quadrants of the hour and if there are at least two valid data points separated by at least 15 minutes to calculate the hourly average, then there is no period of instrument downtime; or

      (B) If the flare is available for operation in only one 15-minute quadrant of the hour and if there is at least one valid data point to calculate the hourly average, then there is no period of instrument downtime.

B. Net Heating Value Analyzer

1. For purposes of calculating the 110 hours per calendar quarter of instrument downtime allowed pursuant to Paragraphs 18 and 38 of the Consent Decree, the time used for NHV analyzer calibration and validation activities required by Subparagraph V.B.1 of this Appendix may be excluded.

2. Any hour that meets the requirements of 40 C.F.R. § 60.13(h)(2) shall not be counted toward instrument downtime. Specifically:

   (i) For a full operating hour (any clock hour where the flare is available for operation for 60 minutes), if there are at least four valid data points to calculate the hourly average (that is, one data point in each of the 15-minute quadrants of the hour), then there is no period of instrument downtime;

   (ii) For a partial operating hour (any clock hour where the flare is available for operation for less than 60 minutes), if there is at least one valid data point in each 15-minute quadrant of the hour in which the flare is available for operation to calculate the hourly average, then there is no period of instrument downtime; and

   (iii) For any operating hour in which required maintenance or quality-assurance activities on the instruments or monitoring systems associated with the flare are performed:

      (A) If the flare is available for operation in two or more quadrants of the hour and if there are at least two valid data points separated by at least 15 minutes to calculate the hourly average, then there is no period of instrument downtime; or

      (B) If the flare is available for operation in only one quadrant of the hour and if there is at least one valid data point to calculate the hourly average, then there is no period of instrument downtime.

VIII. METEOROLOGIC STATION

a. Wind speed sensors must be calibrated annually to +/- 10%.

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APPENDIX 1.12

REPRESENTATIONS OF DISCONTINUOUS WAKE DOMINATED FLOW

APPENDIX 1.12

REPRESENTATIONS OF DISCONTINUOUS WAKE DOMINATED FLOW

Definition

"Discontinuous Wake Dominated Flow" shall mean gas flow exiting a Flare tip that is identified visually by:

i. The presence of a flame that is: (1) immediately adjacent to the exterior of the Flare tip body; and (2) below the exit plane of the Flare tip; and

ii. A discontinuous flame, such that pockets of flame are detached from the portion of the flame that is immediately adjacent to the exterior of the Flare tip body.

Background

The gases present just outside of the flare tip are influenced by several factors. All of these factors are present all of the time, but as process and environmental conditions change, the relative "strength" of each factor will change. The most dominant factors will dictate the flow of the Vent Gases, *i.e.*, will determine the size, shape, and direction of the flame. Some of the influences on the Vent Gases are:

- The low pressure region, or wake, that is downwind and next to the flare.
- The temperature gradient that causes the warm combustion gases to be buoyant, or rise.
- The inertia, or resistance to changes in speed and direction, of the Vent Gases as they exit the tip.

The regimes below show how a flame will appear when the most dominant influences are, respectively, the wake, the buoyancy due to temperature, and the inertia due to the gas's momentum.

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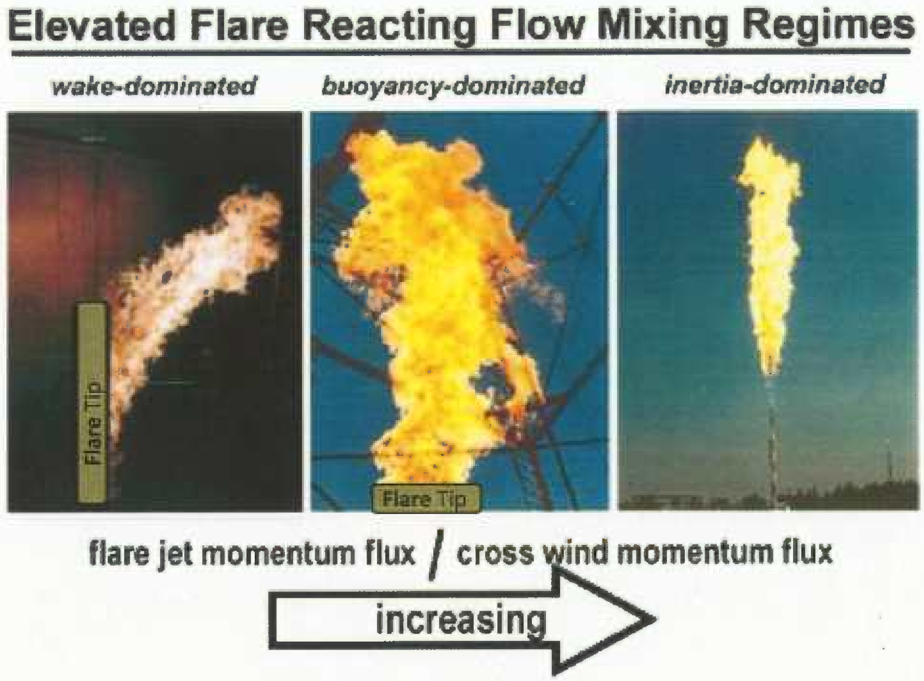

Images take from: Practical Implications of Prior Research on Today's Outstanding Flare Emissions Questions and a Research Program to Answer Them
James Seebold, ChevronTexaco (Retired)
Peter Gogolek, Natural Resources Canada
John Pohl, Virginia Polytechnic Institute and State University
Robert Schwartz, John Zink Company LLC

As a wake dominated flame becomes less stable, it becomes segmented, or discontinuous. The following is a representation of "Discontinuous Wake Dominated Flow." The red area is an artist's rendition of a flame.

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The following image represents a flame below the plane of the exit of the flare tip. However, since the flame is not discontinuous and not immediately adjacent to the tip, this image would not represent Discontinuous Wake Dominated Flow.

The following image represents a flame below the plane of the exit of the flare tip and attached to the tip. However, since the flame is not discontinuous, this image would not represent Discontinuous Wake Dominated Flow.

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In order for the flame to be deemed discontinuous, it should be segmented, and not merely possess small pockets of flame at the outer boundary of a single large cohesive flame. Furthermore, a discontinuous flame will normally appear thin relative to its length, and lack a single bulbous core. The following image represents a flame with a small pocket of flame only at the outer edges of the broad main flame. This would not represent a discontinuous flame, and therefore would not be Discontinuous Wake Dominated Flow.

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APPENDIX 1.15

CALCULATING ROLLING SUMS AND ROLLING AVERAGES

APPENDIX 1.15

ROLLING SUMS AND ROLLING AVERAGES

This Appendix describes how to calculate the standards, exceptions, and triggering events that are on a "rolling sum" or "rolling average" basis in the Consent Decree. Because the calculation of all rolling sums and rolling averages requires the calculation of block sums and block averages, respectively, those concepts are described as well. For rolling sums, the calculation—as the term "sum" implies—requires the use of addition. For rolling averages, the calculation—as the term "average" implies—requires the calculation of the arithmetic mean.

I. ROLLING SUMS

A. Definitions

2.2.1. "Block Sum" means the sum total of the measured or calculated standard, exception, or triggering event during a Block Sum Period. Most often, the term "block sum" is not explicitly used; rather, the concept is implicit in the description.

> Example 1.a. *For an exception to instrument operation that applies during 110 hours of a calendar quarter, the exception is stated in terms of a "Block Sum"—110 hours—but it is not explicitly defined as such. The defendant would add together the total number of hours in a calendar quarter that an instrument was not operating and then compare that sum to the allowed Block Sum value of 110 hours.*

2.2.2. "Block Sum Period" means the uninterrupted period of time during which the Block Sum must be calculated. Most often, the term "block sum period" (and indeed the term "sum period") is not explicitly used; rather, the concept is implicit in the description.

> Example 1.b. *Using Example 1.a, the "Block Sum Period" is a calendar quarter.*

2.2.3. "Rolling Sum" or "*y* rolling sum, rolled *n*" requires: (i) the calculation of a Block Sum during each Block Sum Period of *n* length of time; and (ii) the adding together of the Block Sum values for the total number of Block Sums that equals *y* length of time.

> Example 2.a. *A "365-day rolling sum, rolled daily," requires calculating daily Block Sums and then adding together the values for 365 Block Sums.*

2.2.4. "Rolling Sum Period" means the total length of time for which the Block Sums must be added together.

> Example 2.b. *Using Example 2.a, the "Rolling Sum Period" is 365 days.*

B. Relationship between Block Sums and Rolling Sums

2.2.5. The calculation of a Block Sum is implicit or explicit in the calculation of all Rolling Sums.

Example 3. A "8760-hour rolling sum" without any further description requires the calculation of an hourly Block Sum and then the adding together of 8760 Block Sums.

C. Time of Commencement of and Ability to Calculate Block Sums and Rolling Sums

2.2.6. Block Sums. A Block Sum commences with the first value that is recorded at the start of each Block Sum Period. A Block Sum cannot be calculated until after the last value in the Block Sum Period is recorded.

Example 4. For a Block Sum Period that is "daily," the calculation of the Block Sum commences with the value that is recorded starting at midnight each calendar day and ends with value that is recorded immediately prior to midnight of the next day. For a Block Sum Period that is "hourly," the calculation of the Block Sum commences with the value that is recorded at the top of each hour and ends with value that is recorded immediately prior to the start of the next hour.

2.2.7. Rolling Sums. A Rolling Sum commences with the first Block Sum that is calculated. A Rolling Sum cannot be calculated until the last Block Sum of the Rolling Sum Period is calculated.

Example 5. For a 365-day Rolling Sum, rolled daily, the Rolling Sum commences with the Block Sum that is calculated on the first day of the Rolling Sum Period; however, the first Rolling Sum cannot be calculated until the first 365 days are over (i.e., the 365-day Rolling Sum Period is completed).

D. Standards, Exceptions and/or Triggering Events in this Consent Decree that are on a "Rolling Sum" Basis

2.2.8. The following standards, exceptions, and/or triggering events are on a "rolling sum" basis in the Consent Decree. These standards, exceptions, and/or triggering events therefore require the calculation of Block Sums during Block Sum Periods in order to calculate Rolling Sums:

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TABLE 1

Generic Description of Standards, Exceptions, and/or Triggering Events	Actual Standard, Exception, and/or Triggering Event in the CD	**Block Sum Period** (the "rolled by" period)	**Rolling Sum Period**
Percentage of Time a Compressor is Available for Operation and/or in operation	**95% of the time** (2 Compressors); **100% of the time** (w/ exceptions) (1 Compressors) (¶ 29.b.i)	Hourly	8760 hours
Exempted Hours of Maintenance on FGRS (exempted from percentage of time Available for Operation and/or in operation)	**336 hours** (¶ 29.b.i*(1)*)	Daily	5 years
Hours a Portable Flare is In Operation during outage(s) of a Covered Flare	**504 hours** (¶ 41.c and d)	Daily	1095 days

E. <u>Calculating Rolling Sums for the Percentage of Time a Compressor is Available for Operation and/or in operation</u>

2.2.9. <u>Calculate each Hourly Block Sum</u>. Calculate the amount of time that a compressor is Available for Operation and/or in operation ("A") during each hour (*i.e.,* during each Block Sum Period). Calculate the amount of time during each hour (*i.e.*, each Block Sum Period) that the standard is applicable and for which an exemption does not apply ("R"). Calculate each hourly Block Sum as A/R (which will be a percentage of time). If an exclusion applies during the entire hour, then that hour is not included in the Rolling Sum calculation.

2.2.10. <u>Calculate the Rolling Sum for the first Rolling Sum Period</u>. Add together the first 8760 hourly Block Sums. Use only the prior 8760 1-hour periods when at least some part of the hour was not covered by an exclusion.

2.2.11. <u>Continue calculating the Rolling Sum</u>. Drop out the first Block Sum (*i.e.*, the first hour) in the first Rolling Sum Period and add in the 8761st Block Sum.

F. <u>Calculating Rolling Sums for Exempted Hours of Maintenance on FGRS</u>

2.2.12. <u>Calculate each Daily Block Sum</u>. Calculate the amount of time that a particular Compressor is shut down for exempted maintenance during each day (*i.e.* during each Block Sum Period).

2.2.13. Calculate the Rolling Sum for the first Rolling Sum Period. Add together the first 1826 daily Block Sums ((5 years x 365 days) + 1 leap year day).

2.2.14. Continue calculating the Rolling Sum. Drop out the first Block Sum (*i.e.*, the first day) in the first Rolling Sum Period and add in the 1827th Block Sum.

G. Calculating Rolling Sums for the Number of Hours a Portable Flare is in operation during the outage of a Covered Flare

2.2.15. Calculate each Daily Block Sum. Calculate the number of hours that the Portable Flare is in operation during each day (*i.e.* during each Block Sum Period).

2.2.16. Calculate the Rolling Sum for the first Rolling Sum Period. Add together the first 1095 daily Block Sums.

2.2.17. Continue calculating the Rolling Sum. Drop out the first Block Sum (*i.e.*, the first day) in the first Rolling Sum Period and add in the 1095th Block Sum.

II. ROLLING AVERAGES

A. Definitions

2.2.18. "Block Average" means the arithmetic mean of a measured or calculated parameter during a Block Average Period.

> *Example 6.a. For an exit velocity standard that is applicable on a one-hour block average, the arithmetic mean of all of the measurements during a one-hour period is calculated and compared to the standard.*

2.2.19. "Block Average Period" means the uninterrupted period of time during which the Block Average must be calculated.

> *Example 6.b. Using Example 6.a, the "Block Average Period" is one-hour.*

2.2.20. "Rolling Average" or "*y* rolling average, rolled *n*" requires: (i) the calculation of a Block Average during each Block Average Period of *n* length of time; and (ii) the calculation of the arithmetic mean of the Block Average values for the total number of Block Averages that equals *y* length of time.

> *Example 7.a. A "3-hour rolling average, rolling every 15 minutes" requires the calculation of 15-minute block averages and then the calculation of the arithmetic mean of 12 (i.e., 3 x 4) 15-minute block averages.*

2.2.21. "Rolling Average Period" means the total length of time for which the arithmetic mean of the Block Averages must be calculated.

> *Example 7.b. Using Example 7.a, the "Rolling Average Period" is 3 hours.*

B. Relationship between Block Averages and Rolling Averages

2.2.22. The calculation of a Block Average is implicit or explicit in the calculation of all Rolling Averages.

> *Example 8. A "365-day rolling average" without any further description requires the calculation of daily Block Averages. A "1-hour rolling average, rolled every 5 minutes," requires the calculation of 5-minute Block Averages.*

C. Time of Commencement of and Ability to Calculate Block Averages and Rolling Averages

2.2.23. Block Averages and Rolling Averages. The description set forth in Paragraphs 2.2.6 and 2.2.7 for time of commencement of and ability to calculate Block Sums and Rolling Sums applies equally to Block Averages and Rolling Averages.

> *Example 9. For "a 3-hour rolling average, rolled every 15 minutes," the calculation of the Block Average commences with the first value that is recorded starting at the top of each 15 minute period and ends with the last value that is recorded immediately prior to the start of the next 15 minute period. The Rolling Average commences with the first 15-minute Block Average that is calculated but the first Rolling Average cannot be calculated until all the first twelve Block Averages are calculated. ("Twelve" is the appropriate number of prior 15-minute Block Averages because there are four 15-minute Block Averages in one hour; therefore, there are twelve 15-minute Block Averages in three hours (4 x 3). The "3-hour rolling average, rolled every 15 minutes" would equal the arithmetic mean of twelve 15-minute Block Averages.)*

D. Parameters in this Consent Decree that are on a "Rolling Average" Basis

2.2.24. The following parameters are on a "rolling average" basis in this Consent Decree. These parameters therefore require the calculation of Block Averages during Block Average Periods in order to calculate Rolling Averages:

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TABLE 2

Generic Description of the Parameter	Standard in the CD	Block Average Period (the "rolled by" period)	Rolling Average Period
Volumetric and Waste Gas Mass Flow Rate	(not a standard; just a calculation of the actual) (¶ 21.b.)	Daily	30 days
NHV_{cz} (calculated by GC)	¶ 34.b and App. 2.1	20 minutes	3 hours
NHV_{cz} (calculated by NHV analyzer)	¶ 34.b and App. 2.1	5 minutes	1 hour
S/VG_{mass}	4.0 (¶ 35.a)	5 minutes	1 hour

E. <u>When measured values are "Zero" in a Block Average Period</u>

2.2.25. If, during a Block Average Period, a parameter is measured to be zero, the number "0" is used for that measurement when determining the arithmetic mean of the values (*i.e.*, the Block Average) during the Block Average Period. If all of the measured values during a Block Average Period are zeros, the Block Average is the number "0." "0" *is* a value and "0" should be used in calculating the arithmetic mean. This is distinct from the circumstances identified in Paragraphs 2.2.26 and 2.2.27 below.

F. <u>When one or more measured values either may be excluded for some part of a Block Average Period and/or do(es) not exist for some part of a Block Average Period.</u>

2.2.26. If, for any reason, one or more value(s) of a parameter either: (i) may be excluded for some part of a Block Average Period (*e.g.*, Paragraph 38 applies), and/or (ii) do(es) not exist for some part of a Block Average Period (*e.g.*, an instrument is down), only the remaining value(s) in the Block Average Period are to be used in measuring or calculating the Block Average. For clarity, values that are excluded or do not exist are ***not*** given the number "0." They should not have any value assigned to them. The Block Average is the arithmetic mean of the non-excluded, existing values.

G. <u>When all values in a Block Average Period may be excluded and/or do(es) not exist.</u>

2.2.27. If, for any reason, the value(s) of a parameter either: (i) may be excluded during the entirety of a Block Average Period (*e.g.*, Paragraph 38 applies); and/or (ii) do(es) not exist for the entirety of a Block Average Period (*e.g.*, an instrument is down), then there is ***no*** Block Average for that Block Average Period. (For clarity, the number "0" is *not* the Block Average value in this circumstance.) Under this circumstance, there will be a gap in the Block Average Periods that have values (sometimes referred to as a "gap in the data").

H. NHV_{cz} and S/VG_{mass} limitations in Paragraphs 34 and 35: Calculating Rolling Averages when contiguous Block Average Periods in a Rolling Average Period do not each have a value

2.2.28. If, pursuant to Paragraph 2.2.27, a Block Average Period does not have a value, then that Block Average Period shall be excluded when computing the Rolling Average. The Rolling Average Period—15 minutes or 5 minutes, as applicable—shall include only the prior twelve Block Average Periods that have non-excluded, existing values. "Twelve" is the correct number because there are 12 Block Average Periods in a standard based on a "3-hour rolling average, rolled every 15 minutes" and in a standard that is based on a "1-hour rolling average, rolled every 5 minutes."

> *Example 10. Assume that a standard must be complied with on a 3-hour rolling average, rolled every 15 minutes. Then, assume that in Hours 1, 2, and 3, the standard is applicable during all twelve 15-minute Block Average Periods; then, in Hour 4, the standard does not apply because of excepted instrument downtime; and finally, in Hour 5, the standard is once again applicable during all four 15 minute Block Average Periods. For Hour 4, the records and reports would state that the standard was not applicable. For Hour 5, the Rolling Average in the first 15 minute block would be the average of the last eleven 15 minute Block Averages in Hours 1, 2, and 3 and the first 15 minute Block Average in Hour 5.*

III. WHEN COMPLIANCE FIRST CAN BE DEMONSTRATED

2.2.29. For both Rolling Sums and Rolling Averages, compliance cannot be demonstrated until the first Rolling Sum Period or Rolling Average Period is completed.

> *Example 11. For a standard that is applicable on a 365-day rolling average, rolled daily, where the initial compliance date is January 1, 2014, values must start to be recorded at midnight on January 1, 2014. The first daily Block Average that can be calculated is at midnight on January 2, 2014. Then, assuming there are no gaps in the data, the first Rolling Average that can be calculated is at midnight on January 1, 2015. The first Rolling Average would be the arithmetic mean of the 365 Block Averages calculated for January 1, 2014, through December 31, 2014.*

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APPENDIX 2.1

CALCULATING NHV_{cz} AND $NHV_{cz\text{-}limit}$ FOR FHR'S COVERED FLARES

APPENDIX 2.1

CALCULATING $NHV_{cz\text{-}limit}$ AND NHV_{cz} FOR LOU AND AU FLARES

The LOU and AU Flares at the FHR Facility were subject to Passive FTIR testing in October of 2010. Based on the results of that test, EPA determined that the limits for the Net Heating Value of the Combustion Zone Gas of the LOU and AU Flares are more appropriately based on Vent Gas flow rate than the Vent Gas composition. This Appendix provides the methodology and equations for calculating NHV_{cz} and $NHV_{cz\text{-}limits}$ for the LOU and AU Flares.

All abbreviations, constants, and variables are defined in the Key on Page 4 of this Appendix.

Steps in the Calculations

Step 1: Determine the Net Heating Value of the Vent Gas (NHV_{vg})

For the LOU Flare (where a Gas Chromatograph will be used): The net heating value of the vent gas is calculated and reported from the GC at the conclusion of each analytical cycle. Equation 1 is used by the GC to calculate the vent gas net heating value from each individual compound net heating value. Individual compound volume fractions, except for water, are measured directly by the GC. A company is not required to measure water in Vent Gas. If a company chooses to measure water, then: (i) if the water measurement is taken upstream of a knock-out drum, then water does not have to be included in the calculation of NHV_{vg}; (ii) if no knock-out drum exists or if the water measurement is taken after the knock-out drum, then the company must include water in the calculation of NHV_{vg} and adjust the concentration of the compounds measured by the GC to a wet basis. Individual compound net heating values, including water, are listed in Table 1 of this Appendix.

$$NHV_{vg} = \sum_{i=1}^{n} (x_i \cdot NHV_i) \qquad \textit{Equation 1}$$

For the AU Flare (where a Net Heating Value Analyzer/Calculator will be used): Use the measured value.

NOTE: Table 1 includes two alternative values for the Net Heating Value of hydrogen: the actual NHV of hydrogen (274 BTU/scf) and an "adjusted" NHV of hydrogen (1212 BTU/scf). Companies have the option of using either in calculating NHV_{vg}; however, whichever option is selected also must be used in calculating NHV_{cz}. In this case, FHR has elected to use the actual, not adjusted, NHV of hydrogen.

Step 2: Calculate the Net Heating Value of the Combustion Zone Gas (NHV_{cz})

The NHV in the combustion zone (NHV_{cz}) combines the NHVs of the Vent Gas, pilot gas, and steam and is calculated by Equation 2a (based on mass flow measurement) or 2b (based on volumetric flow measurement). These two equations are equivalent for combustion zone conditions, as shown in Addendum A to this Appendix. The NHV of steam is assumed to be zero. Vent Gas flow rate ($\dot{m}_{vg}$ *or* Q_{vg}) and steam flow rate ($\dot{m}_s$ *or* Q_s) are measured by on-line flow meters. The pilot gas flow rate ($\dot{m}_{pg}$ *or* Q_{pg}) is constant for each flare and set by a regulator.

$$NV_{cz} = \frac{\left(\frac{\dot{m}_{vg} \cdot NHV_{vg}}{MW_{vg}}\right) + \left(\frac{\dot{m}_{pg} \cdot NHV_{pg}}{MW_{pg}}\right)}{\left(\frac{\dot{m}_{vg}}{MW_{vg}}\right) + \left(\frac{\dot{m}_{pg}}{MW_{pg}}\right) + \left(\frac{\dot{m}_{s}}{MW_{H_2O}}\right) + \left(\frac{\dot{m}_{air}}{MW_{air}}\right)} \qquad \textit{Equation 2a}$$

OR

$$NHV_{cz} = \frac{(Q_{vg} * NHV_{vg}) + (Q_{pg} * NHV_{pg})}{Q_{vg} + Q_{pg} + Q_s + Q_{air}} \qquad \textit{Equation 2b}$$

The values for $\dot{m}_s$, $\dot{m}_{air}$, Q_s and Q_{air} are determined as follows for the LOU and AU Flares, which do not have a Minimum Steam Reduction System:

Steam-Assisted Flare without a Minimum Steam Reduction System

$\dot{m}_s$ *or* $Q_s = \textit{measured value}$

$\dot{m}_{air}$ *or* $Q_{air} = 0$

The molecular weight of the vent gas (MW_{vg}) is to be calculated by the GC on the LOU Flare using Equation 3. Individual compound molecular weights are listed in Table 1 of this Appendix.

$$MW_{vg} = \sum_{i=1}^{n} (x_i \cdot MW_i) \qquad \textit{Equation 3}$$

The on-line ultrasonic flow meter on the AU Flare automatically and directly calculates the molecular weight of the Vent Gas of the AU Flare using a proprietary algorithm which involves the speed of sound, temperature, and pressure.

The NHV of the pilot gas (NHV_{pg}) and MW of the pilot gas (MW_{pg}) are calculated using Equations 4 and 5, respectively. These calculations are similar to the vent gas calculations, except the individual compound volume fractions are that of the pilot gas and not the vent gas.

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Individual compound volume fractions are measured by laboratory analysis of a pilot gas sample, or may be taken from the natural gas supplier's laboratory certificate of analysis.

$$NHV_{pg} = \sum_{i=1}^{n} (pg_i \cdot NHV_i) \qquad \textit{Equation 4}$$

$$MW_{pg} = \sum_{i=1}^{n} (pg_i \cdot MW_i) \qquad \textit{Equation 5}$$

Step 3: Calculate the Net Heating Value of Combustion Zone Gas Limit ($NHV_{cz\text{-}limit}$)

For the LOU Flare:

If $\dot{m}_{vg} < 3000$ lb/hr: $NHV_{cz\text{-}limit} = 187$ BTU/scf ***Equation 6***

If $\dot{m}_{vg} \geq 3000$ lb/hr and $< 20{,}049$ lb/hr:

$NHV_{cz\text{-}limit} = 187 + (VG - 3000)*0.0098$ ***Equation 7***

If $\dot{m}_{vg} \geq 20{,}049$ lb/hr: $NHV_{cz\text{-}limit} = 357$ BTU/scf ***Equation 8***

Provided however, that if the following three conditions are met, the $NHV_{cz\text{-}limit}$ shall equal the value achieved by supplying supplemental natural gas at a rate of 3700 lb/hr:

(1) Vent Gas mass flow rate ($\dot{m}_{vg}$) is greater than 13,000 lb/hr;

(2) The S/VG_{mass} is less than or equal to 4.0 on a one-hour rolling average, rolled every five minutes (or it had been increased only to stop Smoke Emissions from occurring); and

(3) Supplemental natural gas is being added at a rate of 3700 lb/hr or more

For the AU Flare:

If $\dot{m}_{vg} < 868$ lb/hr: $NHV_{cz\text{-}limit} = 211$ BTU/scf *Equation 9*

If $\dot{m}_{vg} \geq 868$ lb/hr and < 1567 lb/hr:

$NHV_{cz\text{-}limit} = 211 + (VG - 868)*0.12$ *Equation 10*

If $\dot{m}_{vg} \geq 1567$ lb/hr: $NHV_{cz\text{-}limit} = 295$ BTU/scf *Equation 11*

Step 4: Ensure that during flare operation, $NHV_{cz} \geq NHV_{cz\text{-}limit}$

The flare must be operated to ensure that NHV_{cz} is equal to or above $NHV_{cz\text{-}limit}$ to ensure acceptable combustion efficiency. Equation 12 shows this relationship.

$$NHV_{cz} \geq NHV_{cz-limit}$$ *Equation 12*

APPENDIX 2.1

Key to the Abbreviations:

0.21 = mole fraction of oxygen in air(0.21 lb-mol O_2/lb-mol air)
385.5 = conversion from pound moles to standard cubic feet (385.5 scf/lb-mol)
i = individual numbered compound from column i in Table 1 (unitless)
j = individual numbered compound from column j in Table 1 (unitless)
k = individual gaseous component of the combustion zone (unitless)
$\dot{m}_{air}$ = mass flow rate of air (lb/hr)
$\dot{m}_k$ = mass flow rate of individual combustion zone gas component (lb/hr)
$\dot{m}_{O2-stoich-vg}$ = stoichiometric oxygen mass flow for the vent gas (lb/hr)
$\dot{m}_{pg}$ = mass flow rate of pilot gas (lb/hr)
$\dot{m}_s$ = mass flow rate of total steam (lb/hr)
$\dot{m}_{vg}$ = mass flow rate of vent gas (lb/hr)
$\dot{n}_{O2-stoich}$ = stoichiometric oxygen molar flow for an individual compound (mol/hr)
MW_{H_2O} = molecular weight of water (18.02 lb/lb-mol)
MW_i = molecular weight of individual compound (lb/lb-mol)
MW_k = molecular weight of individual combustion zone gas component(lb/lb-mol)
MW_{O_2} = molecular weight of oxygen (32.0 lb/lb-mol)
MW_{air} = molecular weight of air (28.9 lb/lb-mol)
MW_{pg} = molecular weight of pilot gas (lb/lb-mol)
MW_{vg} = molecular weight of vent gas (lb/lb-mol)
n = list of individual compounds from Table 1 (unitless)
NHV_{cz} = net heating value of the combustion zone (BTU/scf)
NHV_i = net heating value of individual compound (BTU/scf)
NHV_{vg-LFL} = net heating value vent gas at lower flammability limit (BTU/scf)
$NHV_{cz-limit}$ = limit net heating value of the combustion zone (BTU/scf)
NHV_{pg} = net heating value of pilot gas (BTU/scf)
NHV_{vg} = net heating value of vent gas (BTU/scf)
P_{cz} = pressure of combustion zone gas (psia)
P_{std} = ambient pressure at standard condtions (14.696 psi)
pg_i = individual compound volume fraction in pilot gas (vol fraction)
Q_k = individal vent gas component volumetric flow rate (scfh)
$Q_{k,acf}$ = individal vent gas component volumetric flow rate (ft^3/hr)
Q_{vg} = vent gas volumetric flow rate (scfh)
Q_{pg} = pilot gas volumetric flow rate (scfh)
Q_s = steam volumetric flow rate (scfh)
Q_{air} = air volumetric flow rate (scfh)
R = gas constant (10.73 $ft^3 \cdot psi/lb - mol \cdot R$)
S/VG_{mass} = the ratio of the Total Steam Mass Flow Rate to the Vent Gas Mass Flow Rate
T_{cz} = absolute temperature of combustion zone gas (°R)
T_{std} = absolute temperature at standard conditions(528°R)
x = moles of carbon per mole of C_xH_y (mol/mol)
x_i = individual compound volume fraction in the vent gas (vol fraction)
x_j = individual combustible compound volume fraction in the vent gas (vol fraction)
y = moles of hydrogen per mole of C_xH_y (mol/mol)

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Table 1
Individual Compound Properties

i[1]	j	Compound[2]	NHV_i (Btu/scf)	MW_i (lb/lbmol)	C_x	H_y
1	1	Hydrogen	273	2.02	0	2
2	-	Oxygen	0	32.00	n/a	n/a
3	-	Nitrogen	0	28.01	n/a	n/a
4	-	CO_2	0	44.01	n/a	n/a
5	-	CO	316	28.01	n/a	n/a
6	2	Methane	909	16.04	1	4
7	3	Ethane	1619	30.07	2	6
8	4	Ethylene	1501	28.05	2	4
9	5	Propane	2302	44.10	3	8
10	6	Propylene	2182	42.08	3	6
11	7	Butanes	3017	58.12	4	10
12	8	Butenes	2885	56.11	4	8
13	9	1,3-Butadiene	2773	54.09	4	6
14	10	Pentane+ (C_5+)	3715	72.15	5	12
15	11	Benzene	3591	78.11	6	6
16	12	Toluene	4252	92.14	7	8
17	13	Ethylbenzene	4942	106.16	8	10
18	14	O,P,M Xylenes	4958	106.16	8	10

[1] i=all compounds, j=organic compounds and hydrogen

[2] NHV data for all compounds, except O, P, M Xylenes, was obtained from the final report of the PFTIR Test prepared by Clean Air Engineering (report dated June 17, 2011). O, P, M, Xylenes' NHV data is based on the original manufacturer settings for FHR's GC.

APPENDIX 2.1

Addendum A
Verification of Equation 2a and Equation 2b Equivalency

In this Appendix, all gaseous flows (i.e, vent gas, steam, pilot gas, and air) may be measured on either a mass basis (lb/hr) or a volumetric basis (scfh). Depending on which measurement methodology is used, different versions of some equations must be used. These versions are designated with an "a" or "b" (e.g. Equation 2a or 2b). In all cases, these equations are equivalent. This Addendum demonstrates the equivalence of the two methods for calculating NHVcz.

Equation 2b uses volumetric flow rates for the calculation of NHV_{cz}:

$$NHV_{cz} = \frac{(Q_{vg} * NHV_{vg}) + (Q_{pg} * NHV_{pg})}{Q_{vg} + Q_{pg} + Q_s + Q_{air}} \qquad \textbf{\textit{Equation 2b}}$$

The ideal gas law provides a method for determining volumetric flow rate of a specific gas, *k,* in the combustion zone at standard conditions:

$$Q_k = Q_{k,acf} * \frac{P_{cz}}{P_{std}} * \frac{T_{std}}{T_{cz}} \qquad \textbf{\textit{Equation A1}}$$

$$Q_{k,acf} = \frac{\dot{m}_k R T_{cz}}{MW_k P_{cz}} \qquad \textbf{\textit{Equation A2}}$$

$$Q_k = \frac{\dot{m}_k R T_{cz}}{MW_k P_{cz}} * \frac{P_{cz}}{P_{std}} * \frac{T_{std}}{T_{cz}} = \frac{\dot{m}_k R T_{std}}{MW_k P_{std}} \qquad \textbf{\textit{Equation A3}}$$

$$Q_k = \frac{\dot{m}_k * 10.73 * 528}{MW_k * 14.696} = 385.5 \frac{\dot{m}_k}{MW_k} \qquad \textbf{\textit{Equation A4}}$$

Substitution of this expression into Equation 2b gives NHV_{cz} in terms of mass flow:

$$NHV_{cz} = \frac{\left(385.5 \frac{\dot{m}_{vg}}{MW_{vg}} * NHV_{vg}\right) + \left(385.5 \frac{\dot{m}_{pg}}{MW_{pg}} * NHV_{pg}\right)}{385.5 \frac{\dot{m}_{vg}}{MW_{vg}} + 385.5 \frac{\dot{m}_{pg}}{MW_{pg}} + 385.5 \frac{\dot{m}_s}{MW_{H_2O}} + 385.5 \frac{\dot{m}_{air}}{MW_{air}}} \qquad \textbf{\textit{Equation A5}}$$

Because the combustion zone is well-mixed, each gaseous component of the combustion zone is at the same temperature and pressure. Thus, the last expression reduces to Equation 2a:

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$$NHV_{cz} = \frac{\left(\frac{\dot{m}_{vg} \cdot NHV_{vg}}{MW_{vg}}\right) + \left(\frac{\dot{m}_{pg} \cdot NHV_{pg}}{MW_{pg}}\right)}{\left(\frac{\dot{m}_{vg}}{MW_{vg}}\right) + \left(\frac{\dot{m}_{pg}}{MW_{pg}}\right) + \left(\frac{\dot{m}_{s}}{MW_{H_2O}}\right) + \left(\frac{\dot{m}_{air}}{MW_{air}}\right)} \qquad \textbf{\textit{Equation 2a}}$$

This demonstrates the equivalence of Equations 2a and 2b.

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APPENDICES TO CONSENT DECREE

APPENDIX 3.1

FACTORS TO BE CONSIDERED AND PROCEDURES TO BE FOLLOWED TO CLAIM COMMERCIAL UNAVAILABILITY

APPENDIX 3.1

Factors to be Considered and Procedures to be Followed
To Claim Commercial Unavailability

This Appendix outlines the factors to be taken into consideration and the procedures to be followed for FHR to assert that a Low-E Valve or Low-E Packing is "commercially unavailable" pursuant to Paragraph 65 of the Consent Decree.

I. FACTORS

A. Nothing in the Consent Decree or this Appendix requires FHR to utilize any valve or packing that is not suitable for its intended use in a Covered Process Unit.

B. The following factors are relevant in determining whether a Low-E Valve or Low-E Packing is commercially available to replace or repack an existing valve:

1. Valve type (*e.g.*, ball, gate, butterfly, needle) (this ELP does not require consideration of a different type of valve than the type that is being replaced)
2. Nominal valve size (*e.g.*, 2 inches, 4 inches)
3. Compatibility of materials of construction with process chemistry
4. Valve operating conditions (*e.g.*, temperature, pressure)
5. Service life
6. Packing friction (*e.g.*, impact on operability of valve)
7. Whether the valve is part of a packaged system or not
8. Retrofit requirements (*e.g.*, re-piping or space limitations)
9. Other relevant considerations

C. The following factors may also be relevant, depending upon the process unit or equipment where the valve is located:

10. In cases where the valve is a component of equipment that FHR is licensing or leasing from a third party, valve or valve packing specifications identified by the lessor or licensor of the equipment of which the valve is a component

11. Valve or valve packing vendor or manufacturer recommendations for the relevant process unit components.

II. PROCEDURES THAT FHR SHALL FOLLOW TO ASSERT COMMERCIAL UNAVAILABILITY

FHR shall comply with the following procedures if it seeks to assert commercial unavailability under Paragraph 65 of the Consent Decree:

1. FHR must contact a reasonable number of vendors of valves or valve packing that FHR, in good faith, believes may have valves or valve packing suitable for the intended use taking into account the relevant factors listed in Subsections I.A. and I.B above.

a. For purposes of this Consent Decree, a reasonable number of vendors presumptively shall mean no less than three.

b. If fewer than three vendors are contacted, the determination of whether such fewer number is reasonable shall be based on Factors (10) and (11) or on a demonstration that fewer than three vendors offer valves or valve packing considering Factors (1) – (9).

2. FHR shall obtain a written representation from each vendor, or equivalent documentation, that a particular valve or valve packing is not available as "Low-Emissions" from that vendor for the intended conditions or use.

a. "Equivalent documentation" may include e-mail or other correspondence or data showing that a valve or valve packing suitable for the intended use does not meet the definition of "Low-E Valve" or "Low-E Packing" in the Consent Decree.

b. If the vendor does not respond or refuses to provide documentation, "equivalent documentation" may consist of records of FHR's attempts to obtain a response from the vendor.

3. Each Compliance Status Report required by Section VIII of the Consent Decree shall identify each valve that FHR otherwise was required to replace or repack, but for which, during the time period covered by the Report, FHR determined that a Low-E Valve and/or Low-E Packing was not commercially-available. FHR shall provide a complete explanation of the basis for its claim of commercial unavailability, including, as an attachment to the Compliance Status Report, all relevant documentation. This report shall be valid for a period of twelve months from the date of the report for the specific valve involved and all other similar valves, taking into account the factors listed in Part I.

III. OPTIONAL EPA REVIEW OF FHR'S ASSERTION OF COMMERCIAL UNAVAILABILITY

A. At its option, EPA may review an assertion by FHR of commercial unavailability. If EPA disagrees with FHR's assertion, EPA shall notify FHR in writing, specifying the Low-E Valve or Low-E Packing that EPA believes to be commercially available and the basis for its view that such valve or packing is appropriate taking into consideration the Factors described in Part I. After FHR receives EPA's notice, the following shall apply:

1. FHR shall not be required to retrofit the valve or valve packing for which it asserted commercial unavailability (unless FHR is otherwise required to do so pursuant to another provision of the Consent Decree).

2. FHR shall be on notice that EPA will not accept a future assertion of commercial unavailability for: (i) the valve or packing that was the subject of the unavailability assertion; and/or (ii) a valve or packing that is similar to the subject assertion, taking into account the Factors described in Part I.

3. If FHR disagrees with EPA's notification, FHR and EPA shall informally discuss the basis for the claim of commercial unavailability. EPA may thereafter revise its determination, if necessary.

4. If FHR makes a subsequent commercial unavailability claim for the same or similar valve or packing that EPA previously rejected, and the subsequent claim also is rejected by EPA, FHR shall retrofit the valve or packing with the commercially available valve or packing unless FHR is successful under Subsection III.B below.

B. Any disputes under this Appendix first shall be subject to informal discussions between FHR and EPA before FHR shall be required to invoke the Dispute Resolution provisions of Section XIV of the Consent Decree. Thereafter, if the dispute remains, FHR shall invoke the Dispute Resolution provisions.

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APPENDICES TO CONSENT DECREE

APPENDIX 4.1

ENVIRONMENTAL MITIGATION PROJECTS

APPENDIX 4.1

ENVIRONMENTAL MITIGATION PROJECTS

FHR shall spend $2,350,000 and shall comply with the requirements of this Appendix and with Section IX of this Consent Decree ("Environmental Mitigation Projects") to implement and secure the environmental benefits of the Projects described below.

4.1.1. City of Port Arthur Diesel Emissions Reduction Project ("Diesel Emissions Reduction Project")

A. By no later than 120 days of the Date of Entry, FHR, in consultation with the City of Port Arthur ("City"), shall submit a plan ("Diesel Project Plan") to spend $2,000,000 in Project Dollars to implement and complete the retrofitting, repowering, replacement, and/or retiring of as many of the following diesel-engine vehicles (which are owned and operated by the City) as can be retrofitted, repowered, replaced, and/or retired with the $2,000,000 in Project Dollars:

Item	Vehicle No.	Model Year	Make	Model
1	1404	2001	Chevrolet	8 yd Dump Truck
2	1158	1996	Ford	Water Truck
3	1189	1996	Ford	Water Truck
4	1155	1996	Ford	8 yd Dump Truck
5	1214	1996	Ford	8 yd Dump Truck
6	1206	1996	Ford	8 yd Dump Truck
7	1208	1996	Ford	8 yd Dump Truck
8	1218	1996	Ford	8 yd Dump Truck
9	1219	1996	Ford	8 yd Dump Truck
10	1225	1996	Ford	8 yd Dump Truck
11	1220	1996	Ford	8 yd Dump Truck
12	980	1993	Champ	Motor Grader
13	1332	1998	Gradall	XL4100
14	915	1992	GMC	1 ton Flat Bed Truck
15	1413	2000	Gradall	XL4100
16	1389	2000	Caterpillar	Front End Loader
17	1329	1999	GMC	8 yd Dump Truck
18	1330	1999	GMC	8 yd Dump Truck
19	1331	1999	Ford	8 yd Dump Truck
20	1140	1995	Caterpillar	Front End Loader
21	1443	2001	John Deere	Mini-Excavator
22	884	1992	John Deere	Trackhoe
23	1489	2003	Elgin	Street Sweeper
24	1566	2006	Mack/Heil	Commercial Garbage Truck
25	1640	2006	GMC	Tow Truck/Grapple/Trailer

26	1552	2004	GMC	Tow Truck/Grapple/Trailer
27	1788	2007	Autocar/Heil	Commercial Garbage Truck
28	1629	2007	Mack/Heil	Residential Garbage Truck
29	1630	2007	Mack/Heil	Residential Garbage Truck
30	1626	2007	Autocar	Residential Garbage Truck
31	1591	2006	Caterpillar	Mini-Excavator
32	1547	2004	Case	Mini-Excavator

This list hereafter shall be called the "Vehicle List." Nothing in this Paragraph shall prohibit FHR, in consultation with the City, from submitting the Diesel Project Plan sooner than 120 days after the Date of Entry.

B. Prior to the submission of the Diesel Project Plan or in the Diesel Project Plan itself or as the Diesel Project Plan is being implemented, FHR, in consultation with the City, may elect to include vehicles not on the Vehicle List by providing to EPA in writing a justification for the addition. Such vehicles shall be considered a part of the "Vehicle List" for purposes of this Appendix unless EPA disagrees. Changes to the Vehicle List are not material changes and do not require a modification of this Consent Decree.

C. The Diesel Project Plan shall:

1. List the specific proposed vehicles, including model, make, year, and usage of the vehicles to be retrofitted, repowered, replaced, and/or retired; the option selected for the emissions reductions (retrofitting, repowering, replacing, or retiring); if retrofitted or repowered, the EPA- or CARB-certified technology to be used; and the estimated costs;

2. Provide expected implementation timelines and expected completion dates;

3. Describe the schedule and budgetary increments in which FHR shall provide the necessary funding to the City to implement the Project; and

4. Estimate the environmental benefits of the Diesel Emissions Reduction Project including an estimate of emission reductions (*e.g.*, CO, NOx, $PM_{2.5}$) expected to be realized.

D. FHR, working in conjunction with the City, shall implement the Diesel Emissions Reduction Project in accordance with the Diesel Project Plan unless EPA seeks changes to the Plan.

E. The Parties agree that FHR must spend at least $2.0 million in Project Dollars by no later than two years after the Date of Entry. FHR is not precluded from spending $2.0 million sooner than two years after the Date of Entry. A demonstration of adequate justification based on unexpected conditions shall enable FHR to extend the deadline beyond two years after the Date of Entry with the agreement of the City and EPA.

F. FHR, working in conjunction with the City, shall use good faith efforts to secure as much environmental benefit as possible for the Project Dollars expended, but the determination about which option to use to reduce diesel emissions (*i.e.*, retrofitting, repowering, replacing and/or retiring) shall rest exclusively with the City.

G. In determining which vehicles to retrofit, repower, replace, and/or retire, priority should be given to older, higher-polluting vehicles that have high annual usage rates and/or vehicle miles travelled so that the pollution reductions obtained from the Project will be maximized. The order of priority for expending the Project Dollars shall rest exclusively with the City. Notwithstanding the preceding, vehicles numbered 1404, 1158, 1189, and 1332 on the Vehicle List shall be retrofitted, repowered, replaced, and/or permanently retired unless the Diesel Project Plan describes in detail the justification for not retrofitting, repowering, replacing, and/or permanently retiring those vehicles and EPA does not disagree.

H. All vehicles that are replaced or retired shall be disposed of appropriately and shall not remain in or be placed back into service in any way.

I. All diesel engine retrofits conducted under this Diesel Emissions Reduction Project shall use exhaust control technologies verified by EPA or by the California Air Resources Board ("CARB"). A list of EPA-verified technologies can be found at http://epa.gov/cleandiesel/verification/verif-list.htm. A list of CARB-verified technologies can be found at www.arb.ca.gov.diesel.verdev/vt/cvt.htm. If the Diesel Emissions Reductions Project includes diesel particulate filter ("DPF") retrofits, the Diesel Emissions Reduction Project may also include the purchase of DPF service equipment required for proper DPF maintenance.

J. All diesel engine repowering conducted under this Diesel Emission Reduction Project shall use technologies certified by EPA, or by CARB if available, and shall consist of new engine configurations certified to emission standards. Information on engine certification can be found at www.epa.gov/otaq/certdata.htm.

4.1.2 Energy Efficiency Project

A. By no later than 120 days of the Date of Entry, FHR, in consultation with the Southeast Texas Regional Planning Commission, shall submit a plan ("Energy Efficiency Plan") to spend $350,000 in Project Dollars to implement and complete a project for the purchase and installation of environmentally beneficial energy efficiency technologies, including but not limited to windows, doors, lighting, and appliances, to reduce the energy demand in low income residences. The Energy Efficiency Plan may follow the methods and protocols already

established by the Southeast Texas Regional Planning Commission in its implementation of what is known as the Lighthouse Project. Nothing in this Paragraph shall prohibit FHR, in consultation with the Southeast Texas Regional Planning Commission, from submitting the Energy Efficiency Plan sooner than 120 days after the Date of Entry.

B. The Energy Efficiency Plan shall:

1. Describe, in general, the proposed actions and how those actions are consistent with the requirements of this Consent Decree and Section 4.1.2 of Appendix 4.1;

2. Provide expected implementation timelines and expected completion dates;

3. Describe the schedule and budgetary increments in which FHR shall provide the necessary funding to the Southeast Texas Regional Planning Commission to implement the Project; in the alternative, the Energy Efficiency Plan may require one upfront, lump sum payment; and

4. Estimate the environmental benefits of the Energy Efficiency Project.

C. FHR, working in conjunction with the Southeast Texas Regional Planning Commission, shall implement the Energy Efficiency Project in accordance with the Energy Efficiency Plan unless EPA seeks changes to the Plan.

D. To be eligible for consideration for this Project, applicants must:

1. Own homes or reside in homes within the city limits of the City of Port Arthur for a period of at least the previous twelve months; and

2. Have a household income that does not exceed 80% of the average median household income for the Beaumont-Port Arthur Standard Metropolitan Statistical Area.

E. Priority shall be given to applicants who live in the Westside neighborhood of the City of Port Arthur, although the Southeast Texas Regional Planning Commission retains the discretion to undertake energy efficiency improvements in other areas of the City based upon the economic circumstances of the applicants requesting assistance.

F. The Energy Efficiency Project shall be completed within three years from the Date of Entry except that FHR, in consultation and with the approval of Southeast Texas Regional Planning Commission, may request an extension of time to complete the Project if it appears likely that all Project Dollars will not be spent within such three year period despite FHR's best efforts to implement the Energy Efficiency Project within such period.

4.1.3 General Provisions

A. Commencing with the first Semi-Annual Compliance Status Report due under the Decree and continuing thereafter until completion of each of the Projects, FHR shall include in each Compliance Status Report information describing the progress of the Projects and the Project Dollars expended on each Project to date.

B. Upon completion of the Diesel Emissions Reduction Project and upon completion of the Energy Efficiency Project, FHR shall submit to EPA a project completion report in accordance with the requirements of Paragraph 113 of the Consent Decree.

C. Nothing in this Consent Decree or Appendix shall be construed to require FHR to spend more than the amounts set forth in Paragraphs 109 and 110 of the Consent Decree and in Sections 4.1.1 and 4.1.2 of this Appendix on Environmental Mitigation Projects, provided that the amounts expended by FHR and any third party are spent in compliance with all requirements of the Consent Decree and this Appendix.

D. The Parties recognize that implementation of the Projects in this Appendix will require action by third parties (*i.e.*, the City of Port Arthur and Southeast Texas Regional Planning Commission). If FHR is unable to complete a Project in accordance with this Appendix and the Project Plan due to such third-party's failure to fulfill its obligations, and that failure is not caused by FHR and is beyond the control of FHR despite FHR's best efforts to fulfill its obligations, then EPA and FHR may agree to: (1) allow FHR and the third party(ies) to amend the Project Plan as appropriate to successfully complete the Project; or (2) cancel the Project and redirect any unspent funds for the Project that cannot be completed to the other Project identified in this Appendix.

E. Any funds designated for a specific Project that are left unspent at the Project's completion may be redirected by FHR, after consultation and approval by EPA, to the other Project identified in the Appendix.

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APPENDICES TO CONSENT DECREE

APPENDIX 5.1

FENCE LINE MONITORING PROGRAM

APPENDIX 5.1

FENCE LINE MONITORING PROGRAM

Minimum Equipment and Program Requirements:

FHR shall maintain in good working order at the Facility the equipment identified within and adhere to the elements of this Appendix. FHR shall obtain prior approval from EPA before changing any fence line monitoring equipment types (other than like-kind), action levels, or compounds monitored.

1-Hour Analyzers - The monitoring stations at Miller Farm Road and Levee Road are each equipped with 1-Hour Gas Chromatograph (GC) analyzers that monitor at an hourly interval. FHR shall use these monitors for the detection in parts per billion by volume (ppb-v) concentrations of at least Benzene and 1,3-Butadiene. Nothing in this Appendix prohibits FHR from voluntarily choosing to use these monitors for the detection of additional compounds.

15-Minute Analyzers – In addition to the 1-Hour GC Analyzers, the monitoring stations at Miller Farm Road and Levee Road are also equipped with 15-minute GC analyzers that monitor for the detection of Benzene at 15-minute sampling intervals at ppb-v concentrations.

Equipment:

FHR shall maintain and operate the two existing fence line monitoring stations, which are located at Levee Road and Miller Farm Road within the Facility. Each of these stations shall be equipped with a one-hour GC analyzer and a fifteen-minute GC analyzer (benzene only).

FHR shall maintain and use the portable monitoring equipment referenced in this Appendix to aid in investigation activities, as appropriate. This equipment includes, at a minimum, Toxic Vapor Analyzers (TVAs), a parts per billion (PPB) detection handheld analyzer, and infrared cameras.

Action Level Definitions and Limits:

Action Level means a concentration at which internal investigative action is triggered. FHR has set these Action Levels at concentrations that will enhance leak identification and repair. Action Levels do not directly correspond to Federal or State reportable quantities (RQ), Threshold Limit Values (TLV®), or Biological Exposure Indices (BEI®).

1-Hour Action Level means a 1-hour concentration equal to or greater than the concentration for the specific compound as listed below:

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MILLER FARM ROAD 1-HOUR ANALYZER		LEVEE ROAD 1-HOUR ANALYZER	
Compound	**Action Level**	**Compound**	**Action Level**
Benzene	25.0 ppb-v	Benzene	25.0 ppb-v
1,3-Butadiene	25.0 ppb-v	1,3-Butadiene	25.0 ppb-v

15-Minute Action Level means a 15-minute concentration equal to or greater than the 25 ppb-v alarm limit for benzene as identified below:

MILLER FARM ROAD 15-MINUTE ANALYZER		LEVEE ROAD 15-MINUTE ANALYZER	
Compound	**Alarm Limit**	**Compound**	**Alarm Limit**
Benzene	25.0 ppb-v	Benzene	25.0 ppb-v

Investigation Activities:

An exceedance of an Action Level at either fence line monitoring station shall result in an immediate notification at FHR's Process Control Console. Within 24 hours of receipt of this notification, Facility shift personnel, or other appropriate Facility personnel or contractor, shall initiate an investigation in an attempt to identify the source of the Action Level exceedance using concentration and meteorological data provided by the fence line monitoring station(s).

The Facility shift personnel on duty, other appropriate FHR personnel, or contractor should conduct the activities and/or review information below during the field investigation, as appropriate:

- Question FHR personnel on shift and/or contractors as to whether any unusual activities, significant operating changes, and/or maintenance activities are being conducted.
- Use the fence line monitoring compass response plot plan map and/or one of five specific chemical component source maps already available at the Facility to determine the suspected zones based upon site (Miller Farm Road/Levee Road), chemical component(s), and meteorological information.
- If the prevailing wind direction indicates an off-site source from a neighboring industrial facility, the Shift Manager on duty or appropriate FHR personnel or contractor will contact the neighboring facility and provide the data from the fence line monitor.
- Review the gas detection alarm summary to determine if gas sensors throughout the plant detected emissions.

  - If the gas detection alarm summary indicates that emissions may be occurring in a particular area, review any maintenance work or equipment clearings in progress.

- If the Flare Gas Recovery System (FGRS) is down, review the flare report to verify the potential of emissions from the flares.

- Perform a check of possible areas within the Facility for emission sources utilizing the portable PPB RAE®, which is capable of parts per billion (PPB) level detection.

- Contact the on-site Emergency Response (ER) group to monitor using its portable equipment, including a FLIR® IR Gas Detection Camera.

- Contact the LDAR Group for leak detection assistance. LDAR technicians can assist using their TVA or a FLIR® IR Gas Detection Camera.

- Coordinate with other departments and assign Operators or other FHR personnel or contractors to assist in locating a potential source.

Notification:

If the investigation results in the identification of a leak source, Facility shift personnel on duty, other appropriate FHR personnel, or contractor, shall conduct the notification activities below, as appropriate:

- Promptly report the findings to the appropriate Environmental Department personnel.
- Contact necessary FHR personnel and/or contractors for assistance in addressing the source and mitigating the emissions.

If a malfunction to the fence line monitoring system is suspected, the Facility shift personnel on duty, FHR personnel, or contractor shall contact the appropriate resources for technical assistance.

Response Actions:

If the investigation results in the identification of a leak source, the necessary FHR personnel and/or contractor shall undertake, to the extent feasible and as soon as practicable, all appropriate response actions to mitigate or eliminate the source.

Documentation:

As soon as practicable but no later than 24 hours after the Action Level was exceeded, the Facility shift personnel on duty, appropriate FHR personnel, or contractor must complete and distribute an incident report to facility personnel. Note that multiple Action Level exceedances that occurred during the same operational shift can be documented in a single incident report. The report shall include the following, as appropriate:

- Monitoring Site where Action Level Exceedance(s) occurred
- Date and Time of Action Level Exceedance(s)
- Compound and Analyzer (1 Hour or 15 Minute) that alarmed; number of alarms if multiple
- Wind Direction at time of Action Level Exceedance(s)
- Description of investigation activities
- Description of any emissions source(s) identified during investigation
- Identify who was notified regarding Action Level Exceedance(s)

Reports and Schedule:

FHR shall submit Air Monitoring Semi-Annual Reports to EPA that contain, in spreadsheet format, the data collected by the fence line monitoring stations. This data shall include time-synchronized concentration data and meteorological data which shall be presented in contiguous columns on the spreadsheet. The first two columns of each sheet shall be the date and time. In addition, the Air Monitoring Semi-Annual Reports shall include a summary of the internal incident reports described in the previous section of this Appendix and a summary of the response actions, if any, that FHR took as a result of its investigation into an Action Level exceedance.

The Air Monitoring Semi-Annual Reports shall be submitted with the Semi-Annual Reports due under Paragraph 101 of the Decree. The Air Monitoring Semi-Annual Report shall be certified in accordance with Paragraph 107 of the Consent Decree.

FHR shall post the Air Monitoring Semi-Annual Reports on the Internet, with confidential information redacted, at the same time as submission to the EPA.

On a calendar week basis, FHR shall post to a publicly available internet site the data collected by the fence line monitoring stations for the prior week. FHR shall post this data for each calendar week no later than the last day of the following calendar week. The data shall be presented in a form that allows benzene and 1,3 butadiene concentrations, wind speed, and wind direction to be viewed concurrently (*i.e.* in a tabular format). This data shall be

preliminary and subject to change upon completion of a Quality Assurance/Quality Control (QA/QC) check.

On a monthly basis, based upon a QA/QC check, FHR shall revise, if and as necessary, the preliminary fence line monitoring data described above. The revised data shall be posted no later than the last day of the month following the month that the data covers.

FHR shall comply with all terms of this Appendix for a period of two years starting with the Date of Entry.

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APPENDIX 6.1

MARCH 2009 COMPLIANCE AGREEMENT BETWEEN THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY AND FLINT HILLS RESOURCES

Texas Commission on Environmental Quality

COMPLIANCE AGREEMENT

Flint Hills Resources, LP, Port Arthur Chemicals Facility
RN100217389
Jefferson County, Texas

The Texas Commission on Environmental Quality (the "Commission" or "TCEQ") is the state agency charged with enforcing the TEX. HEALTH & SAFETY CODE and TEX. WATER CODE.

Flint Hills Resources, LP, Port Arthur Chemicals Facility ("FHR") is an ethylene and propylene manufacturing facility located at 4241 Savannah Avenue, Port Arthur, Jefferson County, Texas.

FHR has voluntarily disclosed violations of the Commission's regulations pertaining to air emissions. The disclosure was made as a result of a voluntary compliance audit performed by FHR pursuant to the Texas Environmental, Health, and Safety Audit Privilege Act ("Audit Act"). Tex. Rev. Civ. Stat. Ann. art. 4447cc (Vernon's). Notification of FHR's intent to perform the compliance audit was made via facsimile and certified mail on November 2, 2007 of the intent to commence an audit on November 5, 2007. FHR purchased the Port Arthur Chemicals Facility from the Huntsman Petrochemical Corporation in an asset purchase on November 5, 2007. A disclosure was made via certified mail dated April 30, 2008, and a response to comments received from TCEQ was provided on June 30, 2008.

According to FHR's voluntary disclosure statement, the following violations were discovered:

No.	Audit Finding	Associated Rule or Permit Provision
1	4 open-ended lines were found without control by cap, plug or blind, or double block valves.	40 Code of Federal Regulations (CFR) § 63.1033(b) 40 CFR § 63.167(a) 40 CFR § 60.482-6(a) 30 Tex. Admin Code (TAC) § 115.352 (4)
2	5 valves were found without tags that appear to have been overlooked from the leak detection and repair (LDAR) inventory.	40 CFR § 63.1019 40 CFR § 63.1025(b) 40 CFR § 63.160(a) 40 CFR § 63.168(b) 30 TAC § 115.352
3	21P-104 was documented as a sensory leaker on December 9, 2007 by operations. The leak was not documented in the LDAR database and delay of repair (DOR) paperwork was not completed (with reason of isolated from service) before the 15-day deadline.	30 TAC § 115.356(E)(i), (ii) 30 TAC § 115.352(2)(A) and (3) 40 CFR § 63.1026 40 CFR § 63.1038(b)(7)

No.	Audit Finding	Associated Rule or Permit Provision
4	Points of generation for commingled waste streams have been grouped for total annual benzene (TAB) reporting purposes. However, flow and determination of benzene quantity should be reported for each point of generation. Also, drain system and closed vent system monitoring needs to be implemented at the initial point of generation, not downstream.	40 CFR § 61.355(c)(1)(i)
5	Material sent off-site for recycling has not been included in TAB (candidates include spent carbon and used oil).	40 CFR § 61.355(a)
6	Prior sampling for determination of benzene content has not included each phase in multi-phase waste streams. (Only water has been analyzed). Similarly, oil streams are not all accounted for as part of TAB.	40 CFR § 61.355(c)(1)(v)
7	The Title V permit has not been updated to reflect the wastewater applicability determinations that the site is currently operating under. For example, Light Olefins Unit (LOU) stripper as in process, Hazardous Organics NESHAP (HON) and Ethylene Maximum Achievable Control Technology (MACT) overlap with NESHAP FF, storage tank changes of service/applicability.	30 TAC § 122.210(a)
8	Certification statement in quarterly NESHAP FF report does not include affirmation of less than 10 parts per million by weight (ppmw) treatment standard, although the samples reflect less than 10 ppmw.	40 CFR § 61.357(d)(7)(i)
9	NESHAP FF off-site waste notification is not provided with each waste shipment. It is included in the waste profile which is provided one time in advance of shipment.	40 CFR § 61.342(f)(2)
10	Ethylene MACT off-site waste notifications have not been completed.	40 CFR § 63.1096
11	Maintenance wash pad is not included in the TAB and may need to be considered as uncontrolled for purposes of 2 megagram (Mg) exemption.	40 CFR § 61.355(a)

No.	Audit Finding	Associated Rule or Permit Provision
12	No detectible emissions (NDE) monitoring is not conducted for spent carbon supersacks, Frac tanks and vacuum trucks, which are considered containers under Subpart FF.	40 CFR § 61.345(a)(1)(i)
13	The team is comfortable with site's use of HON control requirements to supersede NESHAP FF controls on equipment receiving HON streams; however, this does not allow grouping of all waste streams (including streams not flowing from HON units) for Point of Generation/Determination and reporting purposes.	40 CFR § 63.110(e) 40 CFR § 63.1100(g) 40 CFR § 61.355(a) & (b) 40 CFR § 61.357(d)(2)
14	The team observed bypass lines that were not locked or car sealed closed in the closed vent system for the wastewater stripper unit flare knockout drum.	40 CFR § 61.349(a)(1)(ii) 40 CFR § 63.148(f)
15	The team observed inconsistency in the field tagging and absence of tags in wastewater drain systems and closed vent systems that made it difficult to verify which regulations govern a stream and that fugitive monitoring has been conducted for each stream as required. For example, spot checks of untagged components near the LOU flare knockout pot drain systems could not be identified in the LDAR Database as having been monitored.	40 CFR § 61.346(a)(1)(i)(A) 40 CFR § 61.349(a)(1)(i) 40 CFR § 63.148(f)
16	The roof on the American Petroleum Institute (API) separator has a history of recurring leaks. The roof is vented to a vapor recovery system; however, the leaks that are measured indicate that there are gases from the roof that are not being controlled such that the true partial pressure of the Volatile Organic Compound in those gasses is less than 0.5 psia.	30 TAC § 115.132(a)(3)
17	There are compliance gaps in regulatory applicability because of overlap in regulatory applicability and site practices. Examples include: -Unsafe to monitor and difficult to monitor provisions do not exist for audio/visual/olfactory (AVO) inspection of closed vent systems. -Use of instrument monitoring in lieu of visuals for drains is not sufficient to meet all requirements.	40 CFR § 61.356(g) 40 CFR § 63.110

The Executive Director recognizes that FHR has submitted prompt disclosures and updates and that violation numbers 1, 2, 3, 5, 8, 9, 10, 11, and 12 have been addressed through satisfactory corrective actions.

In response to the voluntary self-disclosure and in an effort to ensure that appropriate efforts to achieve compliance are initiated, pursued with due diligence, and completed within a reasonable time for violation numbers 4, 6, 7, 13, 14, 15, 16, and 17, FHR and the Commission have entered into a Compliance Agreement ("CA"). The provisions of this Agreement are as follows:

1. Respond completely and adequately, as determined by the TCEQ, to all requests for information concerning the "Disclosure of Violation" within 30 days after the date of such requests, or by any other deadline specified in writing.

2. Submit, to the TCEQ Enforcement Division's audit program, quarterly updates of the progress made toward closure of violation numbers 4, 6, 13, 14, 15, 16, and 17. Updates shall be provided within 30 days following the end of each calendar quarter, beginning with the first calendar quarter during which this CA is entered.

3. Submit, to the TCEQ Enforcement Division's audit program, quarterly status updates for permit number O-1317, violation number 7, and send a confirmation letter to the audit program once FHR has received permit issuance confirmation from the Air Permits Division.

4. On or before March 31, 2009, FHR shall submit a proposed regulatory applicability determination to the TCEQ central office for the API separator-related to violation number 16.

5. On or before May 31, 2009, for HON and BWON overlap-related violation numbers 14, 15, and 17, FHR shall:

    a. Conduct a survey of potential bypass lines for closed vent systems associated with HON or BWON process areas.
    b. Conduct a survey of field tagging of wastewater drain systems and closed vent systems to verify which regulations govern each stream so that fugitive monitoring may be conducted as required.
    c. Develop a plan for addressing identified areas of regulatory overlap.

6. On or before August 31, 2009, for Benzene Waste NESHAP (BWON)-related violation numbers 4, 6, 13 and 16, FHR shall:

    a. Complete its identification and begin monitoring existing drain and closed vent BWON streams.
    b. Complete its identification of points of generation for each BWON stream and develop a site sampling strategy sufficient to complete the 2008 Total Annual Benzene ("TAB") report due August 31, 2009.
    c. Complete representative sampling of BWON streams.
    d. Include each phase in multi-phase waste streams in determination of benzene content.
    e. Implement stream tracking systems whereby FHR can certify the TAB report and 2 Mg exemption totals starting in 2008 (TAB report due August 31, 2009).
    f. Submit the 2008 TAB report. This report will be certified, provided that FHR has restarted from its current shutdown by April 1, 2009, without upsets that would impede FHR's ability to capture samples representative of BWON streams. In the event that FHR has not restarted by April 1, 2009, without upsets that would impede FHR's ability to capture samples representative of BWON streams, FHR shall:
        i. Notify TCEQ of these events on or before April 1, 2009;
        ii. Submit its 2008 TAB report to the best of its knowledge;

iii. Submit its 2009 TAB report with a certification on or before August 31, 2010.

g. Complete identification and tagging of components to be included in the FHR Facility's LDAR program within Benzene Waste Management Units.

h. Submit written confirmation to the TCEQ Enforcement Division, Audit Program indicating that the regulatory applicability determination related to violation number 16 has been implemented, or notify the Audit Program in writing that FHR received a contrary determination and include in your response a proposed compliance schedule.

7. By October 1, 2009, FHR shall submit, in writing, verification of compliance with Provision Numbers 1– 6 to:

Mr. Kent Heath, Audit Coordinator
Enforcement Division, MC 219
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

With a copy to:

Ms. Georgie Volz, Regional Director
Texas Commission on Environmental Quality
Region 10
3870 Eastex Freeway, Suite 110
Beaumont, Texas 77703

Should unforeseen future circumstances indicate a need to alter the above mentioned schedule, FHR shall immediately notify the Commission so that an amendment can be discussed.

The effective date of this agreement is the signature date of FHR's authorized representative. Acceptance of the terms of this agreement is indicated by the signatures below.

Kevin Radke
Signature

3/19/09
Date

KEVIN RADKE
Name (Printed or typed)
Authorized Representative of
Flint Hills Resources, LP

Bryan Sinclair
Bryan Sinclair, Director
Enforcement Division
Texas Commission on Environmental Quality

Date 3/2/09

Instructions: Send this signed, original Compliance Agreement to Mr. Kent Heath, Coordinator, Enforcement Division, MC 219, Texas Commission on Environmental Quality, P.O. Box 13087, Austin, Texas 78711-3087. Please keep a copy for your records.